# Phase 3 Report Summary

March 1984

OWMC
Ontario
Waste Management
Corporation

A Crown Agency

## Chairman's Report

**In this summary of our Phase 3 Report, we outline the candidate sites that have been identified as possible locations for liquid industrial and hazardous waste treatment and disposal facilities in Ontario. This summary and the full Phase 3 Report describe the site selection process we have used to identify these sites and the steps we will be taking in the months ahead to choose a preferred site or sites.**

Eight candidate sites have been identified, located in the Cities of Mississauga and Niagara Falls, the Town of Milton and the Township of West Lincoln.

In the next stage of our search, the sites will be examined in greater detail through field surveys and consultation with individuals, agencies and municipalities. This work will result in the selection of a preferred site or sites, which will then be subjected to even closer examination before we submit a proposal to the Hearing Panel on Industrial Waste Management. This panel has been appointed by the Ontario Cabinet to conduct formal hearings on our proposal before submitting their recommendations to the Government.

This summary also presents information about the type of facilities we will be building. Included are the assumptions we have made about the capacities of the facilities, the treatment and disposal processes to be used and the preferred combination or arrangement of these facilities.

Public consultation continues to be an important part of the Corporation's activities. In Phase 3 we met with a total of 310 organizations since the release of the Interim Phase 3 Report in May 1983. During the next stage of our process, a similar public consultation program will provide further opportunities for public involvement.

Because our efforts so far have included considerable public discussion, many people in candidate site communities will be familiar with the Corporation. Nevertheless, we are aware that this report will also be read by many people who know very little about us, our earlier work and our commitments. I want to take this opportunity to urge you to call or write if you would like more information.

Ontario urgently needs the industrial waste management facilities OWMC is establishing. We recognize, however, that many people will have questions to ask and concerns to express. I hope they will take an opportunity to do so in one of the many public consultation meetings in the months ahead.

Sincerely,

Da. Chant

Donald A. Chant
Chairman and President

**OWMC Chairman & President Dr.D.A. Chant**

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# Background Information

The Ontario Waste Management Corporation is a provincial crown agency formally created on July 2, 1981 by the Ontario Legislature. OWMC's primary responsibility is to establish and operate a liquid industrial waste and hazardous waste management system in Ontario. It has no responsibility for managing municipal solid waste or radioactive waste, nor is it a regulator of other industrial waste management systems.

**Before a treatment and disposal facility can be built, OWMC must present its detailed proposals to an independent Hearing Panel on Industrial Waste Management.**

One of the first tasks of the Corporation was to examine the possibility of constructing a treatment and disposal facility at South Cayuga in the Regional Municipality of Haldimand-Norfolk. A site at South Cayuga was tentatively selected by the government before the establishment of OWMC. Preliminary hydrogeological studies of the site conducted for OWMC revealed that it had several shortcomings, and the Board of Directors of OWMC voted unanimously to reject the site in November 1981.

Following the rejection of the South Cayuga site, OWMC conducted a series of meetings with the public in early 1982 and began to develop a broad corporate plan. Several major issues were identified:

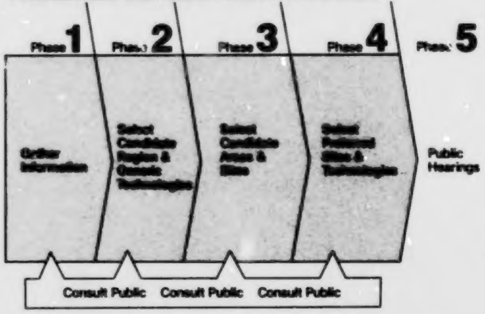
☐ The need to design and build a waste treatment and disposal system to manage safely liquid industrial waste and hazardous waste not presently receiving adequate treatment and disposal in Ontario;

☐ The need to assist Ontario industries in identifying additional ways to reduce and/or recycle liquid industrial waste and hazardous waste, thus reducing the need for treatment and disposal;

☐ The need to consult with the public on the nature and scope of the industrial waste problem and how it can be remedied.

Before a treatment and disposal facility can be built, OWMC must present its detailed proposals to an independent Hearing Panel on Industrial Waste Management, appointed by the Ontario Government for the purpose of conducting formal, public hearings on OWMC's proposals. Following these hearings, the Hearing Panel will submit a report to the Ontario government on the safety and suitability of the Corporation's proposals.

**FACILITIES DEVELOPMENT PROCESS**


Phase 1
Phase 2
Phase 3
Phase 4
Phase 5
Gather Information
Select Candidate Regions & Generic Technologies
Select Candidate Areas & Sites
Select Preferred Sites & Technologies
Public Hearings
Consult Public
Consult Public
Consult Public

A five-phase *Facilities Development Process* was designed to prepare these proposals. Phase 1, completed in September 1982, defined the nature and size of the industrial waste problem, described possible treatment technologies and the hydrogeological conditions throughout Southern Ontario (the underground rock and soil conditions and how they affect underground water movement), and outlined the engineering, planning and environmental issues that should be considered in later phases. Preferred hydrogeological conditions – specifically, a thick uniform clay deposit – are an important site requirement, to avoid total reliance on engineered safety features for the containment of toxic residues. Phase 2, completed in January 1983, resulted in the search for sites being narrowed to the Golden Horseshoe region of Southern Ontario.

The specific objective of Phase 3 was to select candidate sites which may be suitable for one or more of the facilities outlined in Phase 2 (incinerator, physical/chemical treatment plant, engineered landfill). In May 1983, a Phase 3 Interim Report was issued which described nineteen *candidate areas* within the Golden Horseshoe (the highly industrialized area around the western end of Lake Ontario from Oshawa to Niagara Falls) where the search for these sites would be concentrated, and which outlined the search and selection method to be used. Since then, these candidate areas, including an additional area announced by the Corporation in January 1984, have been examined in detail in consultation with the general public and federal, provincial, regional and local planning officials.

Two important steps remain in the Facilities Development Process. First, the candidate sites described in this report must now be studied and compared in greater detail before a preferred site or sites can be selected. Second, the preferred site or sites must then be subjected to detailed, on-the-land investigation, prior to the submission of OWMC's proposal to the Hearing Panel on Industrial Waste Management appointed by the Ontario Cabinet to conduct formal public hearings on the proposal.

# Public Consultation

OWMC's public consultation program has been an important part of the Corporation's planning process. When each major step in this process is completed, a report is issued which summarizes the issues and concerns that have been raised in public meetings, seminars and workshops and the decisions that have been made as a result. The major issues that have been raised in the public consultation program since the release of the Phase 3 Interim Report in May 1983 are summarized here.

**In total, OWMC has met with 310 organizations since May.**

In total, OWMC has met with 310 organizations since May, including one or more meetings with 63 municipal, provincial and federal government ministries and agencies, as well as several public meetings organized by local groups or municipal councils.

## Major issues

Since May 1983 most participants in the consultation program have been residents in the Golden Horseshoe, primarily from the candidate areas identified in the Phase 3 Interim Report. Many of these people were seeking information on OWMC and its proposed facilities, and discussions with them most often occurred in question-and-answer format. Others were interested in discussing either general issues associated with hazardous waste management, such as transportation regulations and reduction and recycling programs, or specific aspects of the site selection process and the factors to be used in the identification of candidate sites.

**Protection of the environment is a continuing, high priority public concern.**

Major trends emerged in discussions with different individuals and groups:

### Transportation

Two major concerns have emerged from discussions on the transportation of special waste:

**A** – the risks associated with transporting wastes over a distance from waste generators to treatment and disposal facilities; and

**B** – the administration and management of waste transportation, particularly the enforcement of adequate safety and emergency measures.

On the first point, the public expressed concern that an accidental spill might occur and that the possibility of this occurrence increases with distance travelled, particularly on local roads. This leads to the second point concerning the administration of transportation. In several instances, participants in OWMC's consultation activities stressed the need for increased regulation, enforcement and administrative control over the transportation of hazardous wastes.

### Environmental and Health Protection

Protection of the environment is a continuing, high priority public concern, particularly in relation to the protection of human health through safeguarding the atmosphere and ground and surface waters. These concerns have progressed from a relatively general expression of the need for environmental protection to more specific discussions supporting the need for an adequate depth of impermeable clay at the site of facilities as a second level of environmental protection beyond that provided by the engineering and design features. This need more often was ranked higher by the public than the transportation factor and the need to preserve agricultural land.

Some participants asked that the Corporation examine the feasibility of warehousing treated waste residues rather than placing them in an engineered landfill.

OWMC is examining this suggestion in addition to its study of other disposal alternatives including deep-mine storage.

**Waste Reduction and Regulations**

The issue of waste reduction and the importance of OWMC encouraging more on-site reuse, recycling and recovery frequently was raised in public consultation discussions.

In the Phase 3 Interim Report issued last May, OWMC outlined the results of a Waste Reduction Opportunities Study commissioned by the Corporation in September 1982. As a result of this study, fourteen roles which would encourage waste abatement, reduction, reuse and recycling, were suggested to OWMC for consideration. Since then, the Corporation has taken three major initiatives. First, a Manager of Waste Reduction has been recruited who will develop specific programs in these areas. Second, the Ontario Waste Exchange has been established jointly by OWMC and the Ontario Research Foundation, to identify opportunities in Ontario for more reuse, exchange and recycling of industrial waste. Third, an OWMC project is examining the barriers or disincentives to waste reduction that presently exist, and its recommendations will contribute to the development of OWMC's waste reduction programs.

Many participants in OWMC's public consultation activities expressed concern about the regulatory framework within which OWMC will operate. In November 1983 OWMC made a detailed submission to the Ontario Ministry of the Environment (MOE) in response to the *Blueprint for Waste Management in Ontario,* a comprehensive series of proposals issued by MOE in June 1983 on all aspects of waste management. That Ministry is the regulatory and enforcement agency for waste management and will regulate the operation of OWMC's facilities.

**Site Selection Process**

Discussions with the public have continued on the site selection process. A series of three weekend seminars was held in June and July in the candidate areas, where a cross-section of residents discussed industrial waste management issues, OWMC's proposed treatment and disposal technologies, and the site selection process. These discussions produced a long list of recommendations, which are contained in the seminar reports available from OWMC.

In the Fall of 1983, three more workshops were held with community representatives to review the site selection factors in greater detail.

Following these Fall workshops, an additional workshop was scheduled in January 1984 in Hamilton, and all participants from the Fall workshops were invited. The Corporation was seeking advice on certain critical choices, or trade-offs, before candidate sites were selected.

These critical choices are listed below, with a summary of the views received in January from the workshop participants:

**The choice between siting a facility on land with relatively low capacity for agriculture vs. siting a facility in an area that may have local areas of potential environmental significance.**

Participants generally supported OWMC's stated preference to avoid both environmentally significant areas and all productive agricultural land. However, if a choice must be made between these factors, most workshop participants supported the preservation of the agricultural land by utilizing a site with local areas of potential environmental significance.

**The choice between locating a facility on shallower clay soils, but within a shorter haul distance of the sources of waste generation vs. locating a facility on deeper clay soils at a greater distance from points of waste generation.**

**The issue of waste reduction and the importance of OWMC encouraging more on-site reuse, recycling and recovery frequently was raised in public consultation discussions.**

## Public Consultation (continued)

The first choice of most participants was for sites which had both deep clay and short haul distances. If a choice had to be made, some participants said that transportation of waste posed by far the greatest hazard. They felt it was most important, therefore, to reduce transportation distance even if this meant that only an adequate minimum depth of clay was available for the treatment and disposal facilities. The conclusions recorded in the small group reports, however, indicate that the majority of the workshop participants still preferred a site with a deeper layer of clay as a protection against any possible groundwater pollution. Because opinion was divided on this issue, OWMC concluded that it would be wise to retain potential sites for further analyses which possessed either one of the characteristics.

**The choice between locating a facility on vacant lands near existing urban development vs. a site in a rural area remote from urban centres.**
This issue was generally resolved in favour of the choices outlined by OWMC. If sites with both low agricultural capability and remote from populated areas and community facilities are not available, most participants preferred to locate the treatment facility in an urban area but away from community facilities. The second choice was for rural areas with minimal agricultural capabilities and minimal impacts on the stability of the agricultural community.

**The choice between a site on high capability agricultural land in an "urban shadow" area where agricultural viability has been reduced by the intrusion of urban forms of development vs. a site on low capability agricultural land in a rural area.**
On this issue some participants agreed with OWMC's preference to select urban shadow areas if use of agricultural land could not be avoided. Others felt that agriculturally productive land should be preserved, even if it is in an urban shadow.

**The choice between a site with deep, uniform clay soils, but centrally located in a stable productive agricultural area vs. a site in an area that is not expected to remain in agricultural use but which has shallower and less predictable clay soils.**
Workshop participants generally preferred sites with deeper clay soils even if these sites were in agriculturally productive lands.

**The choice between a site with relatively good transportation access but within a relatively productive agricultural area vs. a site relatively removed from major sources of wastes but within an area which is not in agricultural use and has limited capability for agriculture.**
Resolution of this issue is not detailed in the group reports, although it was discussed in lengthy plenary discussions. These discussions suggested that although preservation of agricultural land is a significant concern, reasonable reduction of transportation risks should be given a higher priority than the preservation of agricultural land.

# Facilities Design

### Facility Capacity

Planning the exact size of facilities must take into account several factors, in addition to the quantities and types of waste generated. What price should be charged industries for the treatment of their wastes? Too high or too low a price would have a significant impact on quantities coming to the facilities. What regulations will be in place when OWMC facilities are opened? Will industrial waste generation, recycling and in-house treatment tend to increase or decrease in future, and how will they interact? All of these questions must be answered before final decisions are made.

In the meantime, the planning and site selection process must be guided by some basic assumptions on the likely initial and ultimate capacity required. OWMC presently believes that its facilities should be designed with an initial capacity of 150,000 tonnes/year, with provision for future expansion up to 300,000 tonnes/year. About 30,000 tonnes would be organic waste and 120,000 tonnes inorganic waste. This size would have a significant impact on Ontario's most difficult-to-treat and hazardous wastes, but would avoid overcapacity, particularly for treatment of organic wastes.

## Treatment and Disposal Processes

Special waste is classed as either organic or inorganic according to the contaminants it contains. Treatment and disposal technologies differ for the two types of waste. For organic waste, thermal destruction in an incinerator represents both treatment and disposal, because the residues of incineration contain only inorganics. For inorganic waste, physical/chemical treatment renders it innocuous or less hazardous and produces stabilized residues that can be safely disposed of in an engineered landfill.

### Thermal Destruction

When organic special waste is subjected to high temperatures, the molecules of the waste break down. During incineration, the organic waste is destroyed by a reaction with oxygen to form combustion product gases such as carbon dioxide and water vapour. The rotary kiln is widely accepted as the most efficient and flexible means of destroying large volumes of a variety of toxic and hazardous organic wastes in the form of sludges and solids as well as liquids.

The incinerator is fuelled by the energy content of the waste with the addition of fuel as required to maintain high temperatures. Combustion gases from the incinerator contain small amounts of certain contaminants and dust. Most of these materials are removed by a series of air pollution control devices. These devices include electrostatic precipitators and flue gas scrubbers, which can be "wet" or "dry" or a combination of both.

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### Physical/Chemical Treatment

Several proven physical/chemical treatment processes are available that break down, detoxify and reduce the volume of most inorganic wastes. Essentially, two types of processes are used. A physical process, such as filtration, separates contaminants out of the waste stream or changes the physical form of the waste stream. A chemical process, such as acid neutralization, alters the chemical composition of the waste stream. The combination of processes applied to a waste stream depends on its characteristics.

One type of physical/chemical treatment is solidification. Several solidification processes are available. They involve the addition of cement and/or other hardening additives to waste streams or treatment residues to produce a solid mass of low permeability. The use of a solidification process offers the possibility of solidifying all liquid effluents, thus eliminating any liquid discharge from the plant. It also could be used if required to improve the stability of waste residues before they are placed in an engineered landfill. However, with solidification

**The rotary kiln is widely accepted as the most efficient and flexible means of destroying large volumes of a variety of toxic and hazardous organic wastes.**

# Facilities Design (continued)

the volume of waste residues to be disposed of in the landfill could increase from 30 to 250 percent because of the bulking effect of these processes. Truck traffic volume could also increase.

**Landfill Options**

OWMC uses the term "engineered landfill" when referring to its landfill options because all are based on the following principles to ensure their reliability:

**One of the first and most important principles adopted by OWMC's Board of Directors was that no waste would be placed in its landfill that had not been treated beforehand by the world's best available proven technology.**

☐ One of the first and most important principles adopted by OWMC's Board of Directors was that no waste would be placed in its landfill that had not been treated beforehand by the world's best available proven technology, to reduce its toxicity to a minimum and to make it as stable as possible over the long term. Full treatment of hazardous waste beforehand is critical to secure landfill disposal;

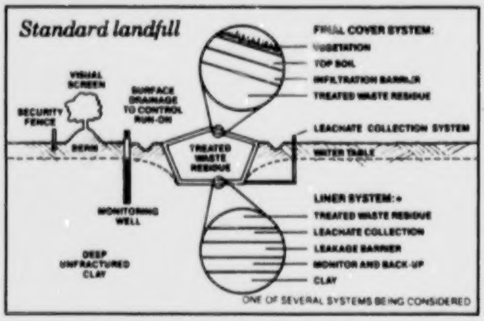
☐ The landfill design should contain certain engineering features which separate waste residues from water, to reduce or control the formation of leachate;

☐ A monitoring system must be installed, and maintained after closure, to provide early warning of any leachate escapes so that remedial action can be taken;

**Even though the landfill will contain man-made safety and monitoring features, the choice of site must offer a natural safeguard as well.**

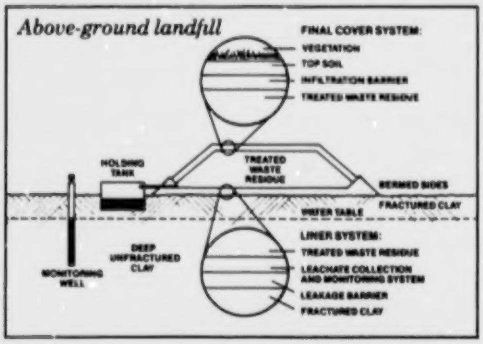
☐ Even though the landfill will contain man-made safety and monitoring features, the choice of site must offer a natural safeguard as well, such as clay or clav/silt of low permeability.

Three types of engineered landfill with the above features are being investigated by OWMC: above-ground, standard, and entombed.

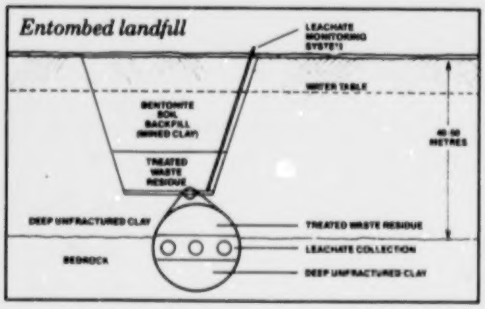

Standard landfill
FINAL COVER SYSTEM:
VEGETATION
TOP SOIL
INFILTRATION BARRIER
TREATED WASTE RESIDUE
VISUAL SCREEN
SURFACE DRAINAGE TO CONTROL RUN-ON
SECURITY FENCE
LEACHATE COLLECTION SYSTEM
BERM
TREATED WASTE RESIDUE
WATER TABLE
MONITORING WELL
LINER SYSTEM: +
TREATED WASTE RESIDUE
LEACHATE COLLECTION
LEAKAGE BARRIER
MONITOR AND BACK-UP
CLAY
DEEP UNFRACTURED CLAY
ONE OF SEVERAL SYSTEMS BEING CONSIDERED

*Standard landfill:* With the standard landfill, treated waste residues are placed in a relatively shallow excavation and mounded above ground. When a cell is full, a low-permeability cover is placed over the residues to minimize water infiltration.

If necessary, leachate produced within the landfill can be removed at the bottom by a drainage layer and collection pipes which lead to a sump. The sump is pumped periodically and can be designed to alter leachate levels. A liner can also be constructed at the bottom of the excavation to isolate the residue from contact with the adjacent soils and the groundwater system.


Above-ground landfill
FINAL COVER SYSTEM:
VEGETATION
TOP SOIL
INFILTRATION BARRIER
TREATED WASTE RESIDUE
HOLDING TANK
TREATED WASTE RESIDUE
BERMED SIDES
FRACTURED CLAY
WATER TABLE
LINER SYSTEM:
TREATED WASTE RESIDUE
LEACHATE COLLECTION AND MONITORING SYSTEM
LEAKAGE BARRIER
FRACTURED CLAY
DEEP UNFRACTURED CLAY
MONITORING WELL

*Above-ground landfill:* In above-ground landfills, a relatively new concept, treated waste residues are placed above the ground surface using a liner and cover of low permeability. Any leachate produced from infiltration of precipitation through the top cover is collected continuously. The leachate drains to a holding tank where, after testing, it is removed for suitable treatment and/or discharge.


Entombed landfill
LEACHATE MONITORING SYSTEM
WATER TABLE
BENTONITE SOIL BACKFILL (MINED CLAY)
TREATED WASTE RESIDUE
40-50 METRES
DEEP UNFRACTURED CLAY
TREATED WASTE RESIDUE
LEACHATE COLLECTION
BEDROCK
DEEP UNFRACTURED CLAY

*Entombed landfill:* In the entombed landfill, treated waste residues are placed in a deep excavation so that the top of the landfill is below the weathered (fractured) surface zone of clay where active groundwater movement may occur. Contaminant movement in unfractured fine-grained clay materials would be extremely slow – a few centimetres a year. However, a greater overall depth of clay is required to ensure an adequate depth of clay beneath the base of the landfill.

At present, the entombed landfill concept is OWMC's least favoured option. It may be impractical in view of the clay depths anticipated at the potential sites, and the bottom layer of clay could be damaged by upward water pressure during construction. At this time, the standard landfill concept appears the most advantageous, particularly for long-term, post-closure maintenance. However, the final selection will be made when site studies have been completed and all hydrogeological, geological and engineering factors have been assessed in more detail.

## Facility Arrangement Options

A major issue that affects site selection is how the three major waste treatment and disposal components can be grouped for siting purposes.

Of the five major facility arrangement options, two are preferred by OWMC: the fully integrated facility on a single site; and the incinerator and physical/chemical facilities on one site with the landfill on a second site. These two facility arrangements appear to minimize both transportation costs, risks and environmental impacts as well as capital and operational costs. The public consultation workshop held in January 1934 tended to reinforce these conclusions while stressing the desirability of finding industrial locations for the incinerator and physical/chemical treatment components, if at all possible.

# Site Selection

## Goals in the Identification of Candidate Sites

The three goals established for the selection of candidate sites, in order of importance, are as follows:

**1** – Minimize risk to human health.
**2** – Minimize environmental impacts.
**3** – Minimize financial costs to OWMC and the people of Ontario.

**1. To minimize risk to human health**

The design, construction, operations, monitoring and contingency planning associated with the facility components must ensure that the likelihood of the release of contaminants with human health consequences will be minimized. This first goal will be attained by such measures as:

☐ the minimization of the quantities of hazardous wastes that require treatment by encouraging reduction, recycling, exchange, and recovery;

☐ the use of the best proven treatment technologies;

☐ construction, operational and monitoring procedures including occupational health and safety guidelines.

No combination of engineering and operations measures, however, can reduce the potential for harm to human health to absolute zero. In the real world there will always remain the possibility of an accidental release of contaminants. Such a possibility has been and remains a primary public concern. In recognition of this concern, together with the commitment of OWMC to minimize risk to human health, the approach adopted has been to give this goal priority in the selection of candidate sites.

**2. To minimize environmental impact**

As explained in the Phase 3 Interim Report, the concept of the environment adopted by OWMC is extremely broad. It includes a diversity of biological, physical and natural resources, land use, land ownership and social and economic concerns and considerations. Potential impacts to be considered are not only those on and around the site, along the access routes and at discharge points for emissions and effluents but also those at a regional level and those with long-term as well as immediate effects. By identifying those features of the total environment most sensitive to the presence and operation of OWMC's facilities, the selection process for candidate sites must emphasize locations where such effects will be reduced to a minimum.

**3. To minimize financial costs to OWMC**

As a crown agency, OWMC must spend public funds in the most efficient and effective manner possible.

With regard to the site selection process this includes the consideration of such potential areas of expenditure as: approvals, site acquisition, on-site development costs, off-site development costs and facility operation costs, including transportation costs.

Financial considerations will not outweigh risk and impact-related considerations. However, there may be instances where an insignificant reduction in risk or impact could have substantial financial implications for OWMC. It would be irresponsible for OWMC not to consider the financial implications of such choices.

# The Identification of Candidate Sites

The process of selecting candidate sites from within candidate areas was divided into three major stages:

☐ The identification of *site areas* by setting aside those parts of the candiate areas that appear to be less suitable.

☐ The identification of specific *potential sites* within these site areas;

☐ The comparison of these potential sites and the setting aside of some to produce a short list of *candidate sites*.

## The Identification of Site Areas: *(Constraint Mapping)*

### A – The Process

The first stage in the selection of candidate sites began by focussing on the candidate areas announced last May. Within these areas many regions and tracts were considered on close examination to be less suitable for the location of any of the three facility components – an engineered landfill, a physical/chemical treatment plant and an incinerator. When those lands were excluded by a mapping techniques called constraint mapping, what remained were described as *site areas* of many shapes and sizes.

The environmental factors taken into account in this first stage reflected the principles and goals of site selection in Phase 3 developed with the assistance of the public consultation program. In particular, the factors represented the following objectives:

☐ the need to provide a second level of environmental protection to inhibit the off-site movement of contaminants;

☐ the need to minimize impact on agricultural resources;

☐ the need to minimize adverse effects on community facilities;

☐ the need to ensure land use compatibility and the particular desirability of using publicly held and/or industrially designated lands, if possible.

Once the *site area* factors supporting these objectives were identified, an intensive process of data collection, analysis and mapping was undertaken. This process resulted in the preparation of 88 maps.

The next step was to decide which factors should be treated as "exclusionary" and which factors should not. An exclusionary factor is one which, when mapped, would identify areas considered unsuitable for a given facility component (e.g. residential areas).

Once decisions were reached regarding the treatment of the factors, two sets of maps were prepared. One set of maps identifies potentially suitable areas for a landfill or a fully integrated facility. The other set of maps identifies areas suitable for an incinerator, a physical/chemical treatment plant, or an incinerator together with a physical/chemical treatment plant.

### B – The Results

This stage in the process resulted in the identification of 65 landfill/integrated *site areas* and 87 physical/chemical treatment and incinerator *site areas*.

## The Identification of Potential Sites *(Site Screening)*

### A – The Process

The second stage reduced the site areas in number and size to *potential sites*. It involved the collection of detailed data on each site area and the application of certain "screening" factors.

During the screening process, site areas were either dropped from further consideration or reduced in size. The screening factors addressed the following questions:

**During the screening process, site areas were either dropped from further consideration or reduced in size.**

# Identification of Candidate Sites (continued)

**Through the public consultation program a strong preference was expressed for industrial areas as locations for the incinerator and physical/chemical treatment plants.**

**Are there areas which are too small or unsuitably shaped to accommodate the size of facility required? (Site Size and Configuration Screen)**
The first step in the screening process was to set aside site areas which were much too small or which were characterized by narrow, irregular configurations which could not be developed properly for the planned facilities.

**Are there areas which are crossed by major services? (Suitability Screen – Linear Facilities)**
The site areas which remained were then examined in terms of major services such as major roads, railways, hydroelectric transmission corridors and other major trunk utilities. Only services which would severely restrict site development were considered. The analysis served in some cases to reduce site areas in size. If the remaining parcels were too small, they were excluded.

**Are there areas which are less suitable because they contain very sensitive environmental areas? (Significant Environmental Units (SEUs) as identified by provincial and/or municipal agencies)**
The occurrence of designated Sensitive Environmental Units on individual areas led to the reduction in size of some site areas and the rejection of others. Site areas were retained if only a small portion of an environmental area would be affected or if the significance of the environmental resources was uncertain.

**Are there areas which are unsuitable because they would result in severe environmental or social impacts? (Suitability Screen – Severe Impacts)**
Some site areas were set aside because of clearly unsuitable conditions such as the following:

☐ physical conditions, e.g. flood plain lands;
☐ major community facilities on site or in the immediate vicinity;
☐ major commercial and industrial uses on the site which would be extremely difficult to relocate;
☐ major population concentrations and/or residentially designated land in the immediate vicinity;
☐ basic conflict between facility components and nearby transportation facilities, e.g. an airport.

**Are there areas which have a number of constraints and no relative advantages over the site areas which could be retained? (Suitability Screen – Relative Suitability)**
In many cases, the site areas which remained at this point were characterized by a number of constraints which individually could not eliminate the site area from further consideration but collectively could be considered sufficient for site rejection.

**Are there areas for a combined physical/chemical treatment plant and incinerator in particular that would mitigate potential impacts on agriculture and/or are in industrially designated areas? (Compatibility Screen)**
A physical/chemical treatment plant and an incinerator have many of the characteristics of medium to heavy industrial uses. Through the public consultation program a strong preference was expressed for industrial areas as locations for the incinerator and physical/chemical treatment plants. Particular importance was also attached to minimizing the impacts of these facilities on agriculture. For these reasons it was concluded that a partially integrated facility should only be considered in the following circumstances:

☐ a landfill site could not be developed as a fully integrated site (for example, if proximity to an airport imposes height restrictions on the incinerator stack);
☐ if impacts on agriculture could be reduced by locating the physical/chemical treatment plant and the incinerator apart from the landfill and in an industrial or, failing that, an "urban shadow" area.

**Are there site areas for a combined incinerator and physical/chemical treatment plant which should be eliminated because they are too far from selected landfills? (Systems Screen)**
One of the major potential impacts associated with a partially integrated facility is the additional noise and disturbance resulting from transportation between facility components. To minimize these impacts preference was given to site areas which were closer to landfills and/or which had fewer sensitive uses, such as houses, along the access roads between the facility components.

### B – The Results

This stage in the process resulted in the identification of 16 potential sites: ten landfill sites and six sites for a combined physical/chemical treatment plant and incinerator. Of the ten landfill sites, two were considered as landfills only, and eight were considered suitable as either landfills or as fully integrated sites.

## From Potential Sites to a Short List of Candidate Sites *(Initial Comparative Evaluation)*

### A – The Process

This stage reduced the list of potential sites to a short list of candidate sites, utilizing several factors. The factors encompass a range of physical, social, resource, biological, land use, transportation and cost considerations for each potential site, the area around each site and the access roads to the sites.

In this stage, a number of important issues emerged in which trade-offs were required. These issues were discussed at a public workshop held in January 1984.

The process by which the 16 potential sites were reduced to eight candidate sites involved site-by-site comparison of more detailed information. The comparative analysis of the potential sites addressed the following two questions:

**Did the additional investigations identify major constraints sufficient to remove some potential sites from further consideration at this time?**
Only two sites, LF-3E and PI-2W, were determined to be unacceptable at this point. The additional investigations determined that site LF-3E in Niagara Falls had a higher probability of being hydrogeologically unsuitable as a landfill than the others. After discussions with Transport Canada it was also concluded that the location of PI-2W in proximity to Hamilton Civic Airport would pose an unacceptable hazard to airport operations.

**In comparing the differences among the potential sites, were there sites which were relatively less suitable which could be dropped from further consideration at this time without seriously limiting the diversity of siting choices for Phase 4?**
Five sites were determined to have major relative disadvantages and no major advantages over the siting options retained.

**Were there sites which possessed major disadvantages with respect to the top-ranked goal-minimizing risk to human health – such that the site could not be expected eventually to be the preferred site?**
Two sites were determined to be unsuitable with respect to this question. The likelihood of an accidental release is extremely remote. However, it was also recognized that, to the maximum extent possible, the site selection process should be shaped to further minimize risk to human health.

### The Results

This analysis led to the reduction in the number of potential sites to the eight candidate sites.

# The Candidate Sites

The eight sites are of varying sizes, which is partly the result of existing land ownership patterns. In other cases, somewhat larger areas are shown than will actually be required because there is a need for more detailed investigations and discussions with municipal representatives and local landowners before the site boundaries can be finalized.

Generally, it is not expected that more than 110 hectares (275 acres) will be required for a landfill or a fully integrated site including a buffer zone. A physical/chemical treatment plant/incinerator site will generally require no more than 110 hectares (200 acres). Only 10 hectares (25 acres) are required for the plant site itself. The balance is the technical buffer area. The possible use and potential disposition of the buffer areas will be investigated on a site-by-site basis in the next site selection step.

**The possible use and potential disposition of the buffer areas will be investigated on a site-by-site basis in the next site selection step.**

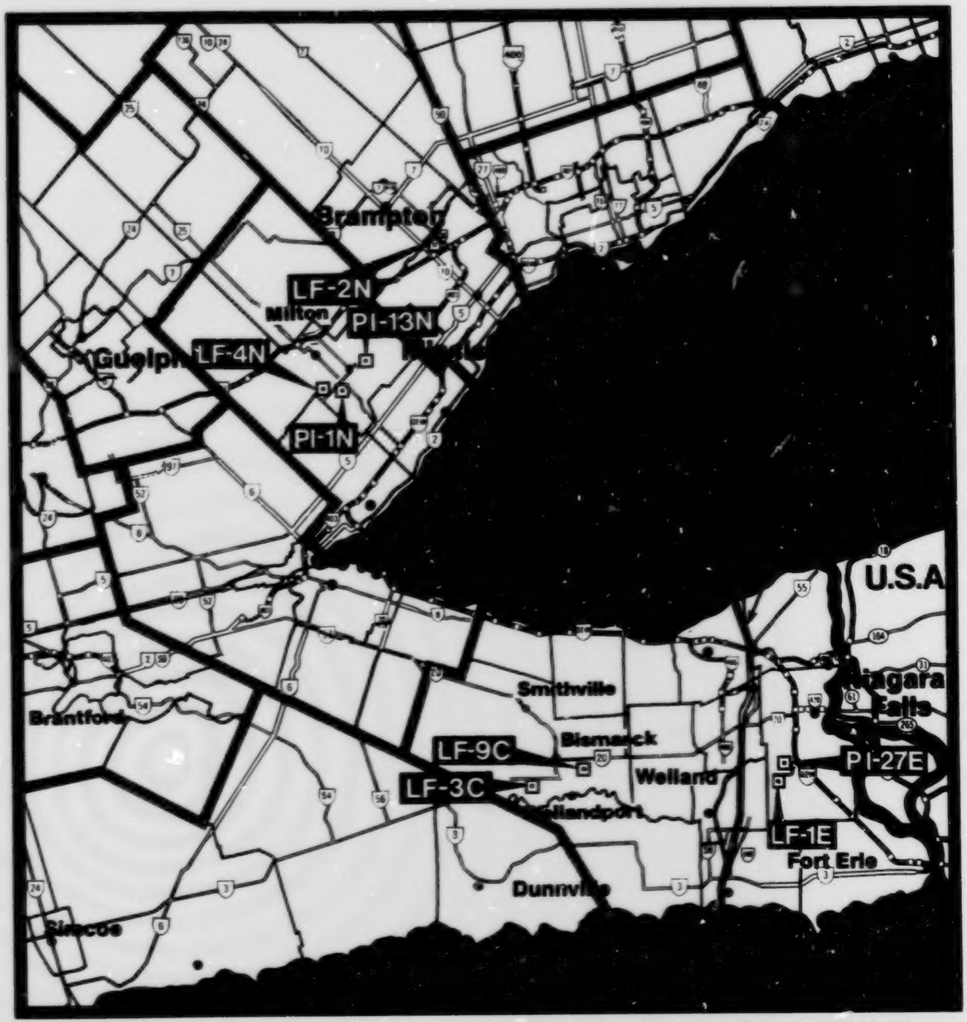
The maps accompanying the site descriptions include preliminary identification of the major access routes to the site. In some cases local access roads may need to be improved and upgraded. Alternative access routes were identified and compared. When a clearly preferable route is not evident, alternative access routes are shown on the maps. These alternative access routes will be considered in greater detail in Phase 4.

All of the sites have major advantages and all have some disadvantages. These advantages and disadvantages vary from site to site and in Phase 4, the trade-offs among siting options will be explored. There are a number of potential constraints associated with each site which must be considered in greater detail. It is also recognized that more detailed field investigations, as well as discussions with provincial and municipal agencies and local residents, may identify additional constraints.

**There are a number of potential constraints associated with each site which must be considered in greater detail.**

| Site No. | Location | Facility |
|---|---|---|
| LF-2N | City of Mississauga (Lots 9 and 10, Concession 1 E.H.S., former Township of Mississauga, City of Mississauga) | Landfill only or Landfill and Physical/ Chemical Treatment Plant |
| LF-4N | Town of Milton (Part of lots 6, 7 and 8, Concession 7, former Township of Nelson, Town of Milton) | Landfill only or Landfill and Physical/ Chemical Treatment Plant |
| PI-1N | Town of Milton (Part of lots 3, 4 and 5, Concessions 1 and 2, former Township of Trafalgar, Town of Milton) | Physical/Chemical Treatment Plant and Incinerator |
| PI-13N | Town of Milton (lots 3 and 4, Concession 6, former Township of Trafalgar, Town of Milton) | Physical/Chemical Treatment Plant and Incinerator |
| LF-3C | Township of West Lincoln (Part of lots 5, 6 and 7, Concession, 1, former Township of Gainsborough, Township of West Lincoln) | Fully Integrated Facility (i.e. Landfill, Physical/Chemical Treatment Plant and Incinerator) or Landfill only |
| LF-9C | Township of West Lincoln (Part of lots 17 and 18, Concession 3, former township of Gainsborough, Township of West Lincoln) | Fully Integrated Facility or Landfill only |
| LF-1E | City of Niagara Falls (Lots 5, 6 & 7, Concessions 2 and 3, Former Township of Crowland, City of Niagara Falls). | Fully Integrated Facility or Landfill only |
| PI-27E | City of Niagara Falls (Part of Lots 1, 2, 3 and 4, Broken Front Concession, Former Township of Crowland, City of Niagara Falls). | Physical/Chemical Treatment Plant and/ or Incinerator |

**Candidate Sites – Site Location**


Brampton
LF-2N
Milton
PI-13N
Guelph
LF-4N
PI-1N
U.S.A.
Niagara Falls
Smithville
Bismarck
LF-9C
Welland
PI-27E
LF-3C
Wellandport
LF-1E
Fort Erie
Dunnville
Brantford
Simcoe

## Legend

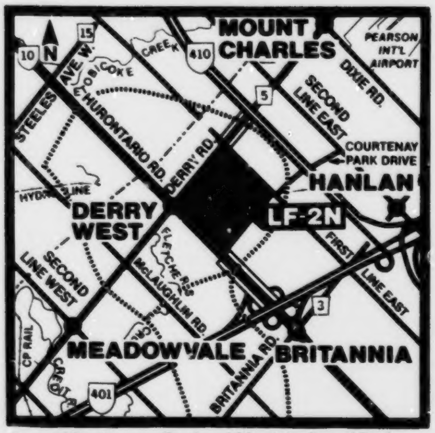
- ▣ Candidate Site
- ▬ Regional Municipal & County Boundaries
- ___ Township, Town & City Boundaries
- LF Landfill
- PI Physical/Chemical Treatment Plant & Incineration

Source: Ontario Waste Management Corporation. March, 1984.
Note: Symbols indicate location only, and not size or shape of sites.

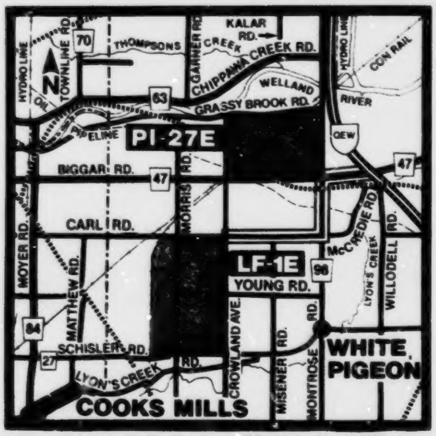
| Site Name | Landfill | Physical/ Chemical | Incinerator | |
|---|---|---|---|---|
| LF-2N | • | • | | |
| LF-4N | • | • | | |
| PI-1N | | • | • | |
| PI-13N | | • | • | |
| LF-3C | • | • | • | Integrated |
| LF-9C | • | • | • | Integrated |
| LF-1E | • | • | • | Integrated |
| PI-27E | | • | • | |

## Candidate Sites (continued)

Legend
401 400 Series Highway
24 Provincial Roads and Highways
7 Regional Roads
Local Roads
Regional Municipalities and County Boundaries
Township, Town and City Boundaries
Candidate Areas
Waterways
Candidate Sites
Access Roads
miles 0 1
kilometers 0 1 2


N
10
15
410
MOUNT CHARLES
PEARSON INT'L AIRPORT
STEELES AVE. W.
CREEK
HURONTARIO RD.
DERRY RD.
5
SECOND LINE EAST
DIXIE RD.
COURTENAY PARK DRIVE
HANLAN
HYDRO LINE
DERRY WEST
LF-2N
FIRST LINE EAST
SECOND LINE WEST
FLETCHER RD.
McLAUGHLIN RD.
3
CP RAIL
MEADOWVALE
BRITANNIA RD.
BRITANNIA
CREDIT
401

City of Mississauga, Regional Municipality of Peel


N
HYDRO LINE
TOWNLINE RD.
70
THOMPSONS
GARNER RD.
KALAR RD.
CREEK
CHIPPAWA CREEK RD.
HYDRO LINE
CON RAIL
WELLAND RIVER
63
GRASSY BROOK RD.
PIPELINE
PI-27E
QEW
47
BIGGAR RD.
47
MORRISON RD.
CARL RD.
MOYER RD.
MATTHEW RD.
LF-1E
YOUNG RD.
98
McCREDIE RD.
LYON'S CREEK
WILLODELL RD.
84
SCHISLER RD.
27
LYON'S CREEK
CROWLAND AVE.
MISENER RD.
MONTROSE RD.
WHITE PIGEON
COOKS MILLS

City of Niagara Falls, Regional Municipality of Niagara

## Description of Sites

### City of Mississauga – Candidate Site LF-2N

Site LF-2N is suitable only for a landfill or a landfill in combination with a physical/chemical treatment plant. An incinerator is not possible at the site because the stack would interfere with the operations of Pearson International Airport. The major advantages associated with LF-2N include its proposed industrial designation, its good regional access and its proximity to other possible facility components in the Town of Milton. In addition, the site has no major constraint on or off-site which would be sufficient to reject the site at this stage although its land costs are estimated to be high.

### City of Niagara Falls – Candidate Site LF-1E

LF-1E has several attributes which make it potentially suitable for either a partially integrated or a fully integrated facility. It is near the QEW and site PI-27E. It is also located in an urban shadow area, near existing and planned industrial areas and appears to be hydrogeologically suitable.

### City of Niagara Falls – Candidate Site PI-27E

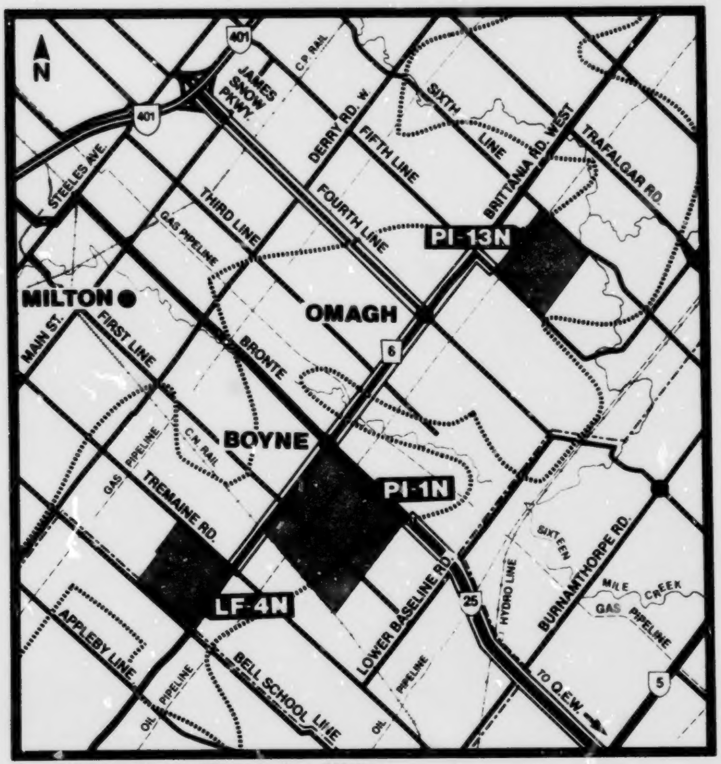
The three major advantages associated with PI-27E are its immediate access to the QEW, its proposed industrial designation and its close proximity to LF-1E. The on and off-site constraints associated with PI-27E also appear to be relatively moderate.

### Town of Milton – Candidate Site LF-4N

Site LF-4N has a number of attributes which make it potentially suitable as a partially integrated facility. It has good regional access, appears to be a good site hydrogeologically, has moderate land acquisition and transportation costs, and appears to have relatively moderate constraints on the site, in the site vicinity or along the access roads to the site. The potential constraints which have been identified to date either require further investigation or are not sufficiently severe (either absolutely or relative to other candidate sites) to warrant rejection at this stage. This investigation will also involve close liaison with Region of Halton officials, who are currently examining possible sites for a regional landfill.

### Town of Milton – Candidate Site PI-1N

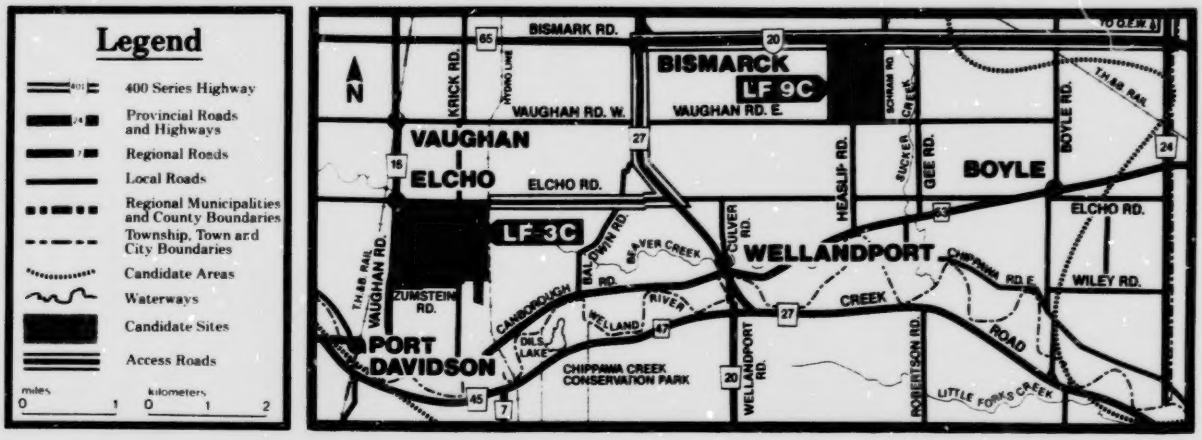
Site PI-1N shares many of the advantages associated with LF-4N including good regional access, hydrogeological suitability (for an incinerator or physical/chemical treatment plant only, because of the limited depth of clay), moderate land costs and no very severe constraints on or off-site. In addition, it is located in an urban shadow area and is further removed from the Niagara Escarpment than LF-4N (approximately 2 km between plant locations), so that the escarpment would represent less of a constraint to air dispersion. It is sufficiently close to LF-4N that the transportation costs and impacts associated with an LF-4N/PI-1N partially integrated option would be relatively minor.


N
401
401
JAMES SNOW PKWY.
C.P. RAIL
DERRY RD. W.
SIXTH LINE
FIFTH LINE
BRITTANIA RD. WEST
TRAFALGAR RD.
STEELES AVE.
THIRD LINE
FOURTH LINE
GAS PIPELINE
PI-13N
MILTON
OMAGH
MAIN ST.
FIRST LINE
BRONTE
6
BOYNE
C.N. RAIL
PIPELINE
GAS
TREMAINE RD.
PI-1N
SIXTEEN
MILE CREEK
GAS PIPELINE
HYDRO LINE
BURNAMTHORPE RD.
LOWER BASELINE RD.
25
LF-4N
APPLEBY LINE
BELL SCHOOL LINE
OIL PIPELINE
OIL
PIPELINE
TO Q.E.W.
5

Town of Milton, Regional Municipality of Halton

### Town of Milton – Candidate Site PI-13N

The advantages associated with PI-13N include good regional access, predominantly publicly-owned land, relatively limited air dispersion constraints (the site is further removed from the Niagara Escarpment and Milton than is PI-1N) and proximity to both LF-4N and LF-2N.


Legend
400 Series Highway
Provincial Roads and Highways
Regional Roads
Local Roads
Regional Municipalities and County Boundaries
Township, Town and City Boundaries
Candidate Areas
Waterways
Candidate Sites
Access Roads
miles 0 1
kilometers 0 1 2
N
BISMARK RD.
BISMARCK
LF 9C
VAUGHAN RD. W.
VAUGHAN RD. E.
KRICK RD.
HYDRO LINE
VAUGHAN
ELCHO
ELCHO RD.
LF-3C
T.H.&B RAIL
VAUGHAN RD.
ZUMSTEIN RD.
PORT DAVIDSON
CANBOROUGH
BALDWIN RD.
BEAVER CREEK
WELLAND RIVER
DILS LAKE
CHIPPAWA CREEK CONSERVATION PARK
CULVER RD.
WELLANDPORT
WELLANDPORT RD.
HEASLIP RD.
SUCKER CREEK
SCHRAM RD.
GEE RD.
BOYLE
BOYLE RD.
ELCHO RD.
WILEY RD.
CHIPPAWA CREEK
RD. E.
ROAD
ROBERTSON RD.
LITTLE FORKS CREEK
TO Q.E.W.
T.H.&B RAIL
65
20
27
16
24
63
47
45
7

## Candidate Sites (continued)

**Township of West Lincoln – Candidate Site LF-9C**
LF-9C also is located in potentially very deep and consistent clay soils, has no air dispersion constraints and moderate land costs. LF-9C is also located on classes 3 and 4 agricultural lands. The site has more direct access than LF-3C, but would have somewhat greater on-site agricultural impacts and may be located over a regionally significant aquifer buried more than 30 m below the deep clays.

Sites LF-3C and LF-9C are relatively less desirable candidate sites because of difficult transportation access and the rural/agricultural nature of the communities in which they are located. Nevertheless, they have been retained for the next stage of analysis because they are located over especially deep and consistent clay soils.

**Township of West Lincoln – Candidate Site LF-3C**
The major advantages associated with LF-3C are its potentially very deep and consistent clay soils, the absence of air quality constraints and moderate land costs. Based on a regional analysis, LF-3C (and LF-9C) offer the deepest and most consistent clay soils of all the candidate sites. LF-3C has the additional advantage that the underlying aquifer is of relatively poor quality for human use. Although located in a stable agricultural area LF-3C is located on predominantly classes 3 and 4 agricultural land and would have relatively moderate on-site agricultural impacts.

# Looking Ahead

## Site Selection

### Selection of Preferred Site or Sites

Phase 4 will involve the collection of further, more detailed information about the candidate sites. To some extent these activities will vary depending on the site under consideration and the concerns and considerations raised by individuals, agencies and municipalities.

The further information required also will be obtained from a number of sources, including federal, provincial and municipal government agencies, and secondary information sources such as reports and recorded data. Meetings with municipalities, private agencies, private landowners, industries, interest groups and individuals will be conducted in order to obtain the most extensive and accurate information available.

The first stage will take several months to complete and will conclude with the selection of a preferred site or sites and the release of a Phase 4 Interim Report.

### Detailed Site Testing

The preferred site(s) will be examined in detail, including on-site drilling, surveys and testing.

A number of additional issues will be analysed in Phase 4. Noise and dust emissions as a result of increased truck traffic along access routes, municipal services and finance, and the visual impact of an OWMC facility on the surrounding landscape will receive detailed consideration. An analysis of possible risk to human health will include consideration of the calculated and perceived risks associated with the transport of special wastes to facility components as well as the short-term and long-term health implications, if any, to people, crops, livestock and sensitive biological resources. The affected municipalities and groups and individuals in the site vicinity and along the access roads will be involved in discussions concerning potential environmental impacts.

## OWMC and the Community

OWMC recognizes that, regardless of where its facilities are located, and how well they are designed, some local residents and municipalities will react negatively to any plan to establish waste management facilities in their community. Many of their fears and concerns should be reduced or eliminated as OWMC describes details of its facility design and of the operating procedures planned. At the same time communities will want to know more about OWMC's views of how a long-term relationship will be established between the Corporation and the communities in which it locates facilities. OWMC is now developing policy options to present for public discussion on the issue of compensation, community benefits and other questions associated with relations between the Corporation and the community. Meetings will then be held under OWMC's public consultation program at which private citizens and public officials can discuss these options.

**Meetings will be conducted in order to obtain the most extensive and accurate information available.**

## Looking Ahead (continued)

**Ontario Waste Management Corporation**

**As a provincial crown agency, OWMC's mandate is to implement a province-wide program for the management of liquid industrial waste and hazardous wastes. This program will include building and managing facilities for the treatment and disposal of wastes and developing programs to assist in the reduction and recycling of these wastes.**

## For more information

**If you would like to receive further information on OWMC's Facilities Development Process or any other aspect of the Corporations activities please contact:**

**OWMC**
**2 Bloor Street West**
**11th Floor**
**Toronto, Ontario**
**M4W 3E2**

**Or telephone using this toll free number:**
**1 800 268-1179**
**(In Toronto call 923-2918)**

## Facility Design and Engineering

Some of the issues and alternatives associated with the planning of the facilities themselves are discussed in Chapter 3 of this report. In Phase 4 further investigation of these questions and others will develop more precise data on process and equipment alternatives. Some of the investigations to be emphasized in Phase 4 are the following:

**Waste quantities and facility capacity:** Analysis of the results of continuing surveys of special waste generation in Ontario will refine the estimates of the types and quantities of waste to arrive at a design capacity for OWMC's facilities.

**Alternative treatment and disposal processes:** Evaluation of different treatment and disposal processes will be pursued by acquiring further data on specific equipment. Combined with more precise waste characterization, this information will allow more detailed comparisons of alternative technologies.

**Potential emissions and impacts:** From the foregoing studies, more detailed estimates on the type of emissions and other environmental impacts (such as transportation) will be made.

**Economic evaluation:** More precise estimates of the cost of waste treatment technologies will also be developed, allowing a better understanding of the Corporation's potential market and its pricing alternatives.

**Design Engineering:** Once the treatment and disposal alternatives at the specific process level are evaluated and favoured options selected, guidelines for construction, operation, monitoring and occupational health and safety will be developed.

## Public Consultation

In Phase 4, the public consultation program will be designed to provide site area residents and municipal and regional officials with numerous opportunities to discuss the work of the Corporation. These activities will include:

☐ a series of information days in each candidate site community. Dates and locations will be announced as soon as possible in local and regional newspapers and on radio;

☐ contact with local groups, societies, clubs and organizations. Letters will be sent to these groups immediately following the release of this report;

☐ a series of workshops and seminars in the candidate site communities for interested participants to discuss Phase 4 issues in more detail. These will be similar in format to the seminars OWMC has held in candidate areas in the past several months.

In addition to these programs, OWMC will be available to meet with municipal and regional councils, planning officials and site area residents to discuss this report.

Ontari
Waste
Corpor

# Facilities Development Process

## Phase 3 Report

March 1984

# ONTARIO WASTE MANAGEMENT CORPORATION
# FACILITIES DEVELOPMENT PROCESS

## PHASE 3 REPORT

The Selection of Candidate Sites

**March 1984**

## PHASE 3 REPORT ERRATA

P. 54 The second and third paragraphs are duplicates of the previous two paragraphs. No material has been omitted.

P. 58 Second last line on page should read "proximity to surface water receiving bodies."

P. 63 Paragraph 3 a) should read:

"This stage reduced the list of potential sites to a short list of candidate sites, using the factors identified in Table 5.2, Page 58. The factors encompass a range of physical and biological resources, land use, recreation and community facilities, transportation, agriculture and cost considerations for each potential site, the area around each site and the access roads to the site."

P. 65 Reference to the Table in the first paragraph should read "Table 5.2."

P. 66 The last sentence on the page should read: "The possible use and potential disposition of the buffer areas will be investigated on a site-by-site basis in the next site selection step."

P. 79 The description of site PI-13N in Table 6.3 should read: "Impact on agricultural areas on-site and in site vicinity."

An additional comment should also appear in reference to PI-27E in Table 6.3: "Impact on industrial areas on-site and in site vicinity."

P. 84 Reference to soil capability for site LF-3C should read: "classes 2, 3 and 4."

P. 85 Reference to soil capability for site LF-9C should read: "classes 2 and 3."

Ontario Waste Management Corporation
April 1984

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# 1. Introduction

## PURPOSE OF THIS REPORT

This report completes the third phase of the Ontario Waste Management Corporation's Facilities Development Process, which is designed to develop proposals for a province-wide industrial waste management system. The specific purpose of this third phase was to select candidate sites which will be studied in detail as possible locations for OWMC's treatment and disposal facilities. These sites are described in Chapter 6 of this report.

The identification of these candidate sites follows the Phase 3 Interim Report issued in May 1983, which described nineteen candidate areas within the Golden Horseshoe (the highly industrialized area around the western end of Lake Ontario from Oshawa to Niagara Falls) where the search for these sites would be concentrated, and outlined the search and selection method to be used. Since then, these candidate areas, including an additional area announced by the Corporation in January 1984, have been examined in detail in consultation with the general public and federal, provincial, regional and local planning officials. The step-by-step search process followed in this examination and the results of each step are outlined in Chapters 4 and 5.

There are two important features of this search process which must be emphasized at the outset. First, although eight candidate sites will now be studied in more detail, the much longer list of potential sites and areas that have been set aside cannot be eliminated absolutely until the process is complete and the Corporation is satisfied that a safe site has been identified. Second, OWMC must satisfy the Hearing Panel on Industrial Waste Management, which has been appointed by the Ontario Cabinet to conduct formal public hearings on OWMC's proposal, that the selected site or sites are safe and suitable for the treatment and disposal of liquid industrial waste. Obviously, there is no "perfect" site anywhere in Ontario; any site will have some constraints. It is OWMC's responsibility to identify sites with minimal constraints and to weigh the advantages and disadvantages of each before submitting its proposal to the Hearing Panel.

Two remaining steps in the Facilities Development Process must be completed before this can occur. First, the candidate sites described in this report must now be studied and compared in greater detail before a preferred site or sites can be selected. Second, the preferred site or sites must then be subjected to detailed, on-the-land investigation. These steps are outlined in Chapter 7.

In the meantime, important planning and engineering decisions must be made on the size of the facilities required and the treatment and disposal technologies to be used. These issues are discussed in Chapter 3.

## BACKGROUND INFORMATION

The Ontario Waste Management Corporation is a provincial crown agency formally created in July, 1981 by the Ontario Legislature. OWMC's primary responsibility is to establish and operate a liquid industrial waste and hazardous waste management system in Ontario. It has no responsibility for managing municipal solid waste or radioactive waste, nor is it a regulator of other industrial waste management systems.

One of the first tasks of the Corporation was to examine the possibility of constructing a treatment and disposal facility at South Cayuga in the Regional Municipality of Haldimand-Norfolk. A site at South Cayuga was tentatively selected by the government before the establishment of OWMC. Preliminary hydrogeological studies of the site conducted for OWMC revealed that it had several shortcomings, and the Board of Directors of the Corporation voted unanimously to reject the site in November 1981.

Following the rejection of the South Cayuga site, OWMC conducted a series of meetings with the public in early 1982 and began to develop a broad corporate plan. Several major issues were identified:

- The need to design and build a waste treatment and disposal system to manage safely liquid industrial waste and hazardous waste not presently receiving adequate treatment and disposal in Ontario.

- The need to assist Ontario industries in identifying additional ways to reduce and/or recycle liquid industrial waste and hazardous waste, thus reducing the need for treatment and disposal.

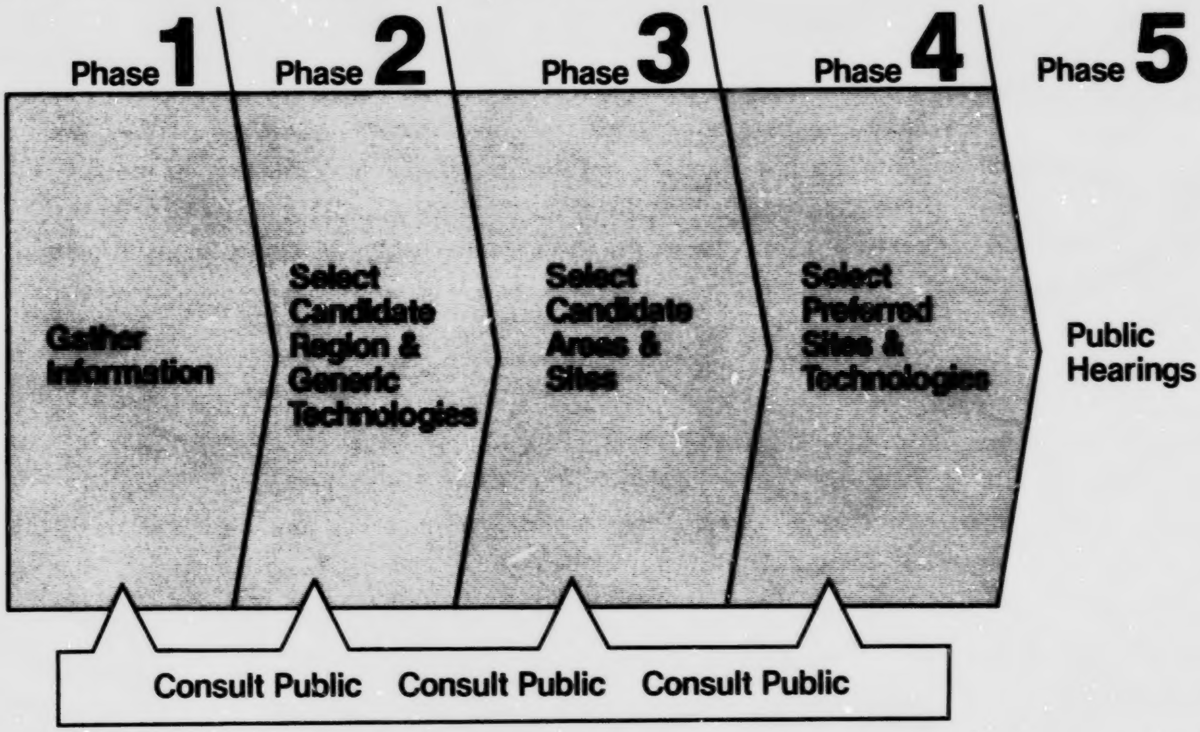
- The need to consult with the public on the nature and scope of the industrial waste problem and how it can be remedied.

Before a treatment and disposal facility can be built, OWMC must present its detailed proposals to an independent Hearing Panel on Industrial Waste Management, appointed by the Ontario Government for the purpose of conducting formal, public hearings on OWMC's proposals. Following these hearings, the Hearing Panel will submit a report to the Ontario Government on the safety and suitability of the Corporation's proposals.

A five-phase Facilities Development Process was designed to prepare these proposals (Figure 1). Phase 1, completed in September 1982, defined the nature and size of the industrial waste problem, described possible treatment technologies and the hydrogeological conditions throughout Southern Ontario (the underground rock and soil conditions and how they affect underground water movement), and outlined the engineering, planning and environmental issues that should be considered in later phases. Preferred hydrogeological conditions - specifically, a thick uniform clay deposit - are an important site requirement, to avoid total reliance on engineered safety features for the containment of toxic residues. Phase 2, completed in January 1983, resulted in the search for sites being narrowed to the Golden Horseshoe region of Southern Ontario.

The specific objective of Phase 3 was to select candidate sites which may be suitable for one or more of the facilities outlined in Phase 2 (incinerator, physical/chemical treatment plant, engineered landfill). In May 1983, a Phase 3 Interim Report was issued, outlining the candidate areas within the Golden Horseshoe where the search for sites would be concentrated.

Figure 1. Facilities Development Process


Phase 1
Phase 2
Phase 3
Phase 4
Phase 5
Gather Information
Select Candidate Region & Generic Technologies
Select Candidate Areas & Sites
Select Preferred Sites & Technologies
Public Hearings
Consult Public
Consult Public
Consult Public

## WHAT THIS REPORT COVERS

This report covers the following topics:

- The Phase 3 public consultation program - the issues raised and the advice received, in particular on the site selection process and the factors to be used in identifying candidate sites.
- The expected size and capacity of OWMC's facilities and the characteristics of the treatment processes that may be used.
- An outline of the five-step site selection process and a review of the steps now completed.
- A detailed outline of how candidate sites were identified.
- A description of the candidate sites.
- The planning and public consultation program to be conducted in Phase 4, when a preferred site or sites will be chosen from among the candidate sites.

# 2. The Phase 3 Public Consultation Program

## INTRODUCTION

As outlined in previous reports, OWMC's public consultation program has been an important part of the Corporation's planning process. When each major step in this process is completed, a report is issued which summarizes the issues and concerns that have been raised in public meetings, seminars and workshops and the decisions that have been made as a result.

This chapter summarizes the major issues that have been raised in the public consultation program since the release of the Phase 3 Interim Report in May 1983. It describes the structure of the program, the main concerns identified by the public and the effect they have had on Phase 3 planning. A more detailed report on the public consultation program is being prepared, which will include transcripts and/or summaries of many of the discussions held. This report will be deposited in municipal and regional libraries where similar reports on Phase 1 and 2 public consultation are now available. A list of these locations is in the Appendix of this report.

## BACKGROUND

OWMC's public consultation program has now evolved through three phases of the Facilities Development Process since September 1982, when the Phase 1 Report was released. In this time several different types of public consultation activities have been developed and have contributed to each phase. Since May 1983, these activities have included the following:

- Contact with agricultural, environmental, municipal, industrial and transportation associations. These included the Environment Committee of the Ontario Federation of Agriculture, the Planning, Energy and Environment Committee of the Association of Municipalities of Ontario, the Ontario Liquid Waste Carriers' Association, the Canadian Manufacturers' Association and the Canadian Chemical Producers' Association.

- A series of three weekend seminars in June and July, to provide an opportunity for a broad cross-section of residents in the candidate areas to discuss the site selection process and industrial waste management issues.

- A series of six information days held throughout the candidate areas. Displays, maps, graphics, reports and a video program were available for public review. Groups wishing to present briefs were invited to do so at one of these locations.

- Four site selection workshops held in October and November 1983 and January 1984, with community representatives invited to discuss the site selection process.

- Meetings with 19 municipal and regional councils in the candidate areas.

- Meetings with municipal, regional, provincial and federal planning and technical staff to collect, verify and discuss information on many site selection factors.

In total, OWMC has met with 310 organizations since May, including one or more meetings with 63 municipal, provincial and federal government ministries and agencies, as well as several public meetings organized by local groups or municipal councils. A more detailed outline of these seminars, workshops, information meetings and participants is contained in the Appendix.

## MAJOR ISSUES

Since May 1983 most participants in the consultation program have been residents in the Golden Horseshoe, primarily from the candidate areas identified in the Phase 3 Interim Report. Many of these people were seeking information on OWMC and its proposed facilities, and discussions with them most often took place in question-and-answer format.

Others were interested in discussing either general issues associated with hazardous waste management, such as transportation regulations and reduction and recycling programs, or specific aspects of the site selection process and the factors to be used in the identification of candidate sites.

It was clear from these discussions that all participants want more detailed information on the technical aspects of OWMC's proposed facilities. For this reason a detailed question-and-answer document has been prepared and this also is contained in the Appendix. Major trends emerged in these discussions, however, particularly on the issues of: 1) transportation; 2) human health and the protection of the environment; 3) waste reduction and regulation issues; and 4) the site selection process. The following is a summary of these concerns and of the impact they have had on OWMC planning.

## 1. Transportation

Two major concerns have emerged from discussions on the transportation of special waste:

a) the risks associated with transporting wastes over a distance from waste generators to treatment and disposal facilities; and

b) the administration and management of waste transportation, particularly the enforcement of adequate safety and emergency measures.

On the first point, the public expressed concern that an accidental spill might occur and that the possibility of this occurrence increases with distance travelled, particularly on local roads. This leads to the second point concerning the administration of transportation. In several instances, participants in OWMC's consultation activities stressed the need for increased regulation, enforcement and administrative control over the transportation of hazardous wastes. Specifically, it was suggested frequently that:

- the contents of each vehicle should be labelled clearly;
- drivers should be well trained in driving and safety precaution;

- emergency response training for hazardous waste spills should be provided to all local and regional fire fighters;
- a "spills manual" should be published to aid in the identification and proper clean-up of spilled materials; and
- more comprehensive and accurate methods of quantifying and classifying wastes that are transported should be developed.

## 2. Environmental and Health Protection

Protection of the environment is a continuing, high priority public concern, particularly in relation to the protection of human health through safeguarding the atmosphere and ground and surface waters. These concerns have progressed from a relatively general expression of the need for environmental protection to more specific discussions supporting the need for an adequate depth of impermeable clay at the site of facilities as a second level of environmental protection beyond that provided by the engineering and design features. As outlined later in this chapter, this need more often was ranked higher by the public than the transportation factor and the need to preserve agricultural land.

Some participants asked that the Corporation examine the feasibility of warehousing treated waste residues rather than placing them in an engineered landfill. OWMC is examining this suggestion in addition to its study of other disposal alternatives including deep-mine storage.

## 3. Waste Reduction and Regulations

The issue of waste reduction and the importance of OWMC encouraging more on-site reuse, recycling and recovery frequently was raised in public consultation discussions.

In the Phase 3 Interim Report issued last May, OWMC outlined the results of a Waste Reduction Opportunities Study commissioned by the Corporation in September 1982. As a result of this study, fourteen roles which would encourage waste abatement, reduction, reuse and recycling, were suggested to OWMC for consideration. Since then, the Corporation has taken three major initiatives. First, a Manager of Waste Reduction has been recruited who will develop specific programs in these areas. Second, the Ontario Waste Exchange has been established jointly by OWMC and the Ontario Research Foundation, to identify opportunities in Ontario for more reuse, exchange and recycling of industrial waste. Third, an OWMC project is examining the barriers or disincentives to waste reduction that presently exist, and its recommendations will contribute to the development of OWMC'S waste reduction programs.

Many participants in OWMC's public consultation activities expressed concern that the regulatory framework within which OWMC will operate should encourage on-site waste reduction, reuse and recovery and ensure that those wastes which remain are directed to adequate treatment facilities. Concerns were also expressed that consistent enforcement of improved waste management regulations is essential to the implementation of an effective waste management system.

In November 1983 OWMC made a detailed submission to the Ontario Ministry of the Environment (MOE) in response to the Blueprint for Waste Management in Ontario, a comprehensive series of proposals issued by MOE in June 1983 on all aspects of waste management. That Ministry is the regulatory and enforcement agency for waste management and will regulate the operation of OWMC's facilities. The Corporation's comments on the Blueprint cover the areas of: definition and classification of hazardous wastes; waste transportation and regulation; reduction, reuse and recovery; and public involvement in waste management decision-making. Copies of OWMC's submission are available on request from the Corporation.

## 4. Site Selection Process

Last May, the Corporation outlined the changes that had been made to the site selection process as a result of discussions and seminars held with the public during Phase 2. In particular, a broader array of land use factors was added to the list of factors to be considered in selecting candidate sites.

Since then, discussions with the public have continued on the site selection process. As outlined earlier in this chapter, a series of three weekend seminars was held in June and July in the candidate areas, where a cross-section of residents discussed industrial waste management issues, OWMC's proposed treatment and disposal technologies, and the site selection process. These discussions produced a long list of recommendations, which are contained in the seminar reports available from OWMC. For the purposes of this section, however, it is appropriate to summarize the major site selection issues that emerged from these summaries:

- The importance of considering the impact of the proposed facilities on the community's character and lifestyle as a site selection factor.

- The need to consult and involve site communities in operational issues such as emission standards and controls, safety and noise abatement procedures, landscaping and design, and emergency measures planning.

- The need to consider the impact of the facilities on residents along local and regional transportation access routes to the facilities, in terms of traffic volumes and noise.

- The importance of reducing to a minimum the distance which untreated waste must be transported, provided that the environmental standards required in a site are not sacrificed to achieve shorter haulage distances.

In the Fall of 1983, three more workshops were held with community representatives to review the site selection factors in greater detail. Participants in these workshops emphasized the following points:

- The importance of locating facilities on deep clay soils as a second level of environmental protection. However, it was recognized that physical constraints, such as soil types and the presence of moraines and drumlins, are not as severe limitations for locating physical/chemical and incinerator facilities as for the landfill.

- The importance of avoiding flood-prone lands.

- The importance of avoiding sensitive environmental areas. However, it was also recognized that some areas would require detailed evaluation before being eliminated on this basis.

- The importance of avoiding high quality, productive agricultural land capable of producing specialty crops. Less productive land would be more suitable if necessary for OWMC's facilities.

- The desirability of locating on publicly owned and/or industrial land if at all possible.

- The importance of avoiding sites near sensitive areas such as schools, hospitals, shopping centres and public buildings.

Following these Fall workshops, some who had participated raised concerns about their format, which may not have allowed enough time for more detailed discussion, and the need for more background information, forwarded in advance, on the technical issues and questions to be discussed. For these reasons an additional workshop was scheduled in January 1984 in Hamilton and all participants from the Fall workshops were invited. A background document was distributed in advance containing technical information, responses to the issues raised by participants in the Fall workshop, and an outline of certain critical choices, or trade-offs, on which the Corporation was seeking advice before candidate sites were selected.

These critical choices are listed below, with a summary of the views received in January from the workshop participants:

- **The choice between siting a facility on land with relatively low capacity for agriculture vs. siting a facility in an area that may have local areas of potential environmental significance.**

  Participants generally supported OWMC's stated preference to avoid both environmentally significant areas and all productive agricultural land. However, if a choice must be made between these factors, most workshop participants supported the preservation of the agricultural land by utilizing a site with local areas of potential environmental significance.

- **The choice between locating a facility on shallower clay soils, but within a shorter haul distance of the sources of waste generation vs. locating a facility on deeper clay soils at a greater distance from points of waste generation.**

The first choice of most participants was for sites which had both deep clay and short haul distances. If a choice had to be made, some participants said that transportation of waste posed by far the greatest hazard. They felt it was most important, therefore, to reduce transportation distance even if this meant that only an adequate minimum depth of clay was available for the treatment and disposal facilities. The conclusions recorded in the small group reports, however, indicate that the majority of the workshop participants still preferred a site with a deeper layer of clay as a protection against any possible groundwater pollution. Because opinion was divided on this issue, OWMC concluded that it would be wise to retain potential sites for further analyses which possessed either one of the characteristics.

- **The choice between locating a facility on vacant lands near existing urban development vs. a site in a rural area remote from urban centres.**

  This issue was generally resolved in favour of the choices outlined by OWMC. If sites with both low agricultural capability and remote from populated areas and community facilities are not available, most participants preferred to locate the treatment facility in an urban area but away from community facilities. The second choice was for rural areas with minimal agricultural capabilities and minimal impacts on the stability of the agricultural community.

- **The choice between a site on high capability agricultural land in an "urban shadow" area where agricultural viability has been reduced by the intrusion of urban forms of development vs. a site on low capability agricultural land in a rural area.**

  On this issue some participants agreed with OWMC's preference to select urban shadow areas if use of agricultural land could not be avoided. Others felt that agriculturally productive land should be preserved, even if it is in an urban shadow.

- **The choice between a site with deep, uniform clay soils, but centrally located in a stable productive agricultural area vs. a site in an area**

**that is not expected to remain in agricultural use but which has shallower and less predictable clay soils.**

Workshop participants generally preferred sites with deeper clay soils even if these sites were in agriculturally productive areas.

- **The choice between a site with relatively good transportation access but within a relatively productive agricultural area vs. a site relatively removed from major sources of wastes but within an area which is not in agricultural use and has limited capability for agriculture.**

  Resolution of this issue is not detailed in the group reports, although it was discussed in lengthy plenary discussions. These discussions suggested that although preservation of agricultural land is a significant concern, reasonable reduction of transportation risks should be given a higher priority than the preservation of agricultural land.

## CONCLUSION

The Phase 3 public consultation program has provided both the Corporation and the public with numerous opportunities to discuss together many complex and controversial issues - on the type of treatment technologies to be used, their impacts on the environment and the factors to be used in the selection of sites. Throughout all of these discussions, two consistent themes were expressed - the need for more technical information on the treatment and disposal processes to be used, and the importance of ranking environmental protection factors at the top of the list when selecting sites.

As outlined in this chapter, OWMC has been faced with many difficult choices, or tradeoffs, in its selection of candidate sites. The public workshops have assisted the Corporation greatly in addressing these issues, in addition to the information and advice it has received from government agencies and its own consultants. Incorporating all of these views into the search process has been a difficult task, and it obviously has not been possible to reconcile all points of view. Chapters 4 and 5 of this report outline the approach OWMC has adopted, and how the site selection process has taken the results of its consultation process into account.

# 3. Facility Capacity Design and Operations

## INTRODUCTION

Throughout the Facilities Development Process, certain questions have generated wide public discussion and resulted in several planning decisions. These questions are: what types and quantities of industrial waste are produced in Ontario, where are they generated, how can they be treated safely and what size of facility is required? This chapter reviews these issues and examines the following:

- refinements in waste quantity estimates and the question of facility capacity;
- treatment and disposal processes proposed for the facilities;
- questions associated with facility operations; and
- estimates of the sizes of sites required.

## WASTE QUANTITIES AND FACILITY CAPACITY

### Waste Quantities

To determine what facilities to build, OWMC must estimate how much waste will be received for treatment and disposal, what types of waste will be represented and what form they will be in. To begin to answer these questions, OWMC commissioned a Waste Quantities Study in Phase 1 which proposed a definition and classification of liquid industrial waste and hazardous waste and estimated the types, quantities and sources of industrial waste generated in Ontario in 1981.

The study produced several important results:

- First, OWMC defined liquid industrial waste and hazardous waste that it must treat as "special waste" - that is, waste that cannot properly be dealt with by conventional treatment facilities such as municipal sewage treatment plants, municipal incinerators and municipal landfills.

- Second, the Corporation adopted the waste classification system developed at the University of California at Davis (UCD) to classify the numerous types of industrial waste requiring special treatment in Ontario. The proposed waste types, 79 in number, were listed in the appendices to the Corporation's Phase 1 and Phase 2 Facility Development Reports.

- Third, the study estimated that approximately 1.5 million tonnes (330 million gallons) of special waste were produced in Ontario in 1981. Approximately 70% was generated in and near the highly industrial area around Lake Ontario, from Oshawa to Niagara Falls, known as the Golden Horseshoe.

- Fourth, of the estimated 1.5 million tonnes of special waste produced in Ontario in 1981, over 50% was estimated to be either treated, disposed of or recycled at on-site facilities and by the private sector in Ontario, or exported. The remainder was discharged under permit to municipal sewer systems or deposited in licensed municipal landfills.

Since these data were collected, OWMC staff have continued to refine the estimates and to discuss them with industrial associations, waste generators, the waste treatment industry and federal and municipal authorities. A working group of OWMC and waste management officials in the Ontario Ministry of the Environment has also been examining the data in more detail.

These discussions, and market research that OWMC has undertaken since the Phase 1 Waste Quantities Study, have identified several recent trends and developments in Ontario that will have an important effect on the types and quantity of waste likely to require treatment at OWMC facilities:

- Significant capacity exists in the private waste treatment sector to treat organic waste (approximately 25% of Ontario's special waste is organic). Specifically, Tricil Limited near Sarnia is now equipped to treat and dispose of 140,000 tonnes a year of organic waste; more than 53,000 tonnes were treated by this facility in 1983.

- In 1982, more than 13,000 tonnes of organic waste were sent to receivers outside Ontario; New York State, Michigan, Quebec and Alberta received most of this material. Some of these jurisdictions are planning to develop additional organic waste treatment facilities.

- Many organic wastes are treated by the generator on site using biological treatment, carbon adsorption and other technologies, to eliminate the wastes or to reduce effluent levels. It is expected that the trend towards increased in-house treatment of these waste streams will continue.

- The recycling industry is active in Ontario and in adjacent jurisdictions. Recycling is on the increase, particularly with the recovery of solvents, the reclamation of oil from organic waste and the extraction of valuable metals from electroplating waste. More than 285,000 tonnes of waste are recycled each year in Ontario by the recycling industry and by waste generators, according to OWMC estimates.

- There are no major off-site facilities in Ontario capable of treating inorganic waste, which constitutes approximately 75% of Ontario's special waste. In 1983, a major solidification plant was opened in Quebec, and it now receives a small quantity of inorganic waste from Ontario.

These factors indicate a need for certain types of additional treatment processes, while underlining the importance of avoiding an unnecessary duplication of services.

The estimates of special waste generation in Ontario are being further refined by OWMC to allow more precise identification of the specific quantities and types of special waste OWMC may expect to receive. An interview survey of one thousand representative companies is being conducted to obtain information on materials produced, present waste generation rates, the characteristics of these wastes and the treatment and disposal methods now used. The data collected will help determine the design criteria for OWMC's facilities.

## Initial and Ultimate Facility Capacity

Planning the exact size of facilities must take into account several factors, in addition to the quantities and types of waste generated. What price should be charged industries for the treatment of their wastes? Too high or too low a price would have a significant impact on quantities coming to the facilities. What regulations will be in place when OWMC facilities are opened? Will industrial waste generation, recycling and in-house treatment tend to increase or decrease in future, and how will they interact? All of these questions must be answered before final decisions are made.

In the meantime, the planning and site selection process must be guided by some basic assumptions on the likely initial and ultimate capacity required. The developments outlined earlier indicate that OWMC should be cautious when determining the initial capacity of its facilities:

- There is a trend towards more recycling, more on-site treatment and more private sector waste treatment capacity.

- Despite this trend, there is a need for additional facilities to treat inorganic waste, concentrated organic residues and other particularly difficult and expensive-to-treat waste streams in Ontario.

- An analysis of European industrial waste treatment facilities, servicing markets similar in size to Ontario's special waste market, indicates that initial waste treatment capacity should not be as large as market studies suggest. Many of these facilities have excess capacity because the quantities of waste received were much lower than predicted by the waste quantity estimates prepared prior to their construction.

In Phase 2, OWMC's Board of Directors established three key principles to guide decisions on facility size and capacity:

- The initial installation should be capable of expansion through designs that leave room for new construction, equipment that allows for modular expansion, and technologies that favour increased capacity through extra shifts, wherever practical, rather than new construction of additional installations.

- To avoid the design of wasteful excess capacity because of the uncertainty inherent in market estimates, the initial capacity of the facilities should be lower than OWMC's estimate of the final quantity that ultimately will come to its facilities.

- Nevertheless, the initial capacity should be large enough to make a significant impact on the problem of special waste in Ontario, particularly the most potentially hazardous waste streams, and to allow all treatment components to operate efficiently.

Based on these principles, and considerations outlined in this chapter, OWMC presently believes that its facilities should be designed with an initial capacity of 150,000 tonnes/year, with provision for future expansion up to 300,000 tonnes/year. As outlined later in this chapter, about 30,000 tonnes would be organic waste and 120,000 tonnes inorganic waste. This size would have a significant impact on Ontario's most difficult-to-treat and hazardous waste, but would avoid overcapacity, particularly for treatment of organic waste.

## TREATMENT AND DISPOSAL PROCESSES

In addition to providing information on total waste quantities, OWMC's studies have supplied data on the different types of special waste generated in Ontario. This waste stream information is being used to provide the basis for the design of OWMC's facilities.

The Phase 2 Report outlined certain principles concerning the types of treatment and disposal technologies required:

- OWMC facilities, no matter how large or small they ultimately may be, must be designed to handle all types of special waste identified as requiring treatment. This full service responsibility is inherent in the concept of OWMC as a crown agency.

- Special waste must undergo treatment to the fullest possible extent using the world's best proven technology, and the remaining residues must receive the most secure containment possible.

Based on these principles and on an engineering study by OWMC's consultants, OWMC has determined that for site selection purposes the initial treatment and disposal facilities should be as follows:

- The facilities would consist of high-temperature thermal destruction, physical/chemical treatment processes including solidification, and an engineered landfill.

- Only one installation of each major component is contemplated at this time.

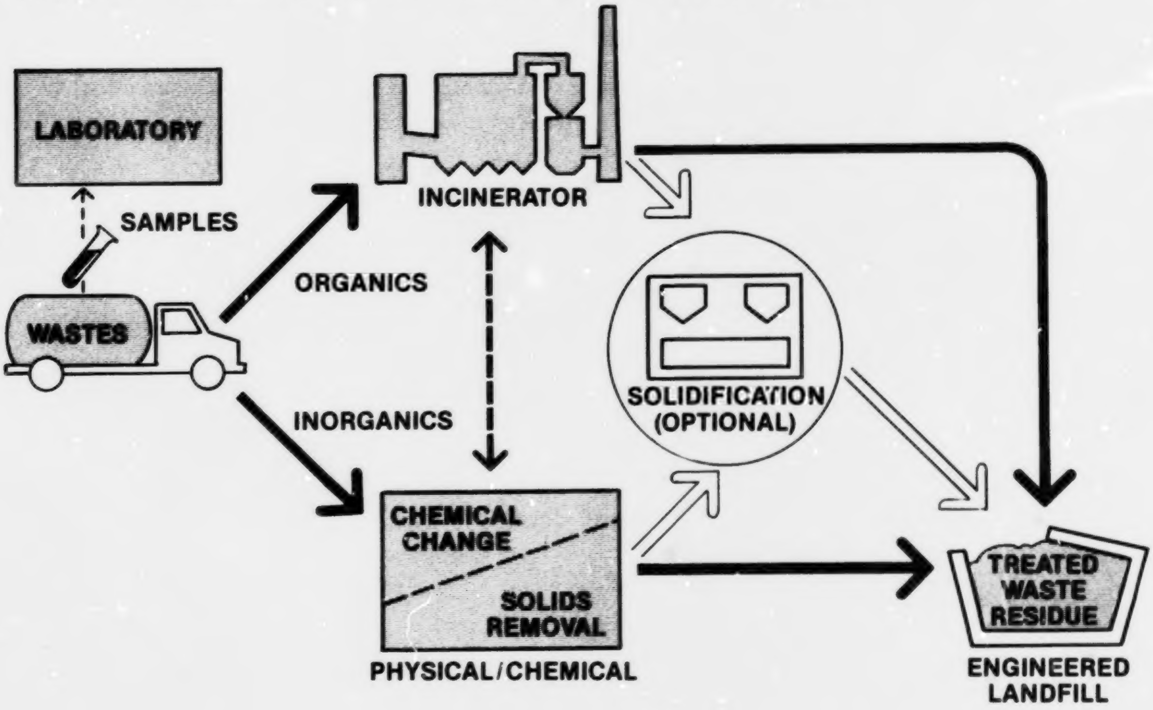
Special waste is classed as either organic or inorganic according to the contaminants it contains. Treatment and disposal technologies differ for the two types of waste. For organic waste, thermal destruction represents both treatment and disposal, because the residues of incineration contain only inorganics. For inorganic waste, physical/chemical treatment renders it innocuous or less hazardous and produces stabilized residues that can be safely disposed of in an engineered landfill (see Figure 2). The facilities for the treatment of both organic and inorganic waste will now be described in more detail.

## Thermal Destruction

When organic special waste is subjected to high temperatures, the molecules of the waste break down. During incineration, the organic waste is destroyed by a reaction with oxygen to form combustion product gases such as carbon dioxide and water vapour.

Several technologies are available for the thermal destruction of organic special waste. Prominent among them are the various types of incinerators: rotary kiln, liquid injection, fluidized bed, and multiple hearth. Each type of equipment has its own operating advantages and limitations. A worldwide study of available thermal destruction processes is continuing. The rotary kiln is widely accepted as the most efficient and flexible means of destroying large volumes of a variety of toxic and hazardous organic wastes in the form of sludges and solids as well as liquids.

Figure 2. Industrial Waste Treatment & Disposal System


LABORATORY
SAMPLES
WASTES
ORGANICS
INORGANICS
INCINERATOR
SOLIDIFICATION
(OPTIONAL)
CHEMICAL
CHANGE
SOLIDS
REMOVAL
PHYSICAL/CHEMICAL
TREATED
WASTE
RESIDUE
ENGINEERED
LANDFILL

A typical rotary kiln capable of treating special wastes operates as follows (Figure 3):

- Organic waste is fed into the rotary kiln by automatic feeding processes which handle solids, liquids and sludges, and pastes.
- A rotary kiln with a capacity to burn 30,000 tonnes/year of organic special waste is a cylindrical steel shell, about 3-4 metres in diameter and 13-14 metres long. It rotates slowly on a 3-4° slope to provide for the breakup and flow of the waste, and burns the waste at temperatures up to 1400°C.
- Flue gases formed during combustion in the kiln enter the secondary combustion chamber and are burned off at even higher temperatures. Residues from the combustion process in the form of slag and ash are collected at the bottom of this chamber and deposited in the engineered landfill.
- Gases leaving the secondary chamber are normally at a temperature of 1000°C to 1200°C. A heat recovery boiler can be installed to cool the gas to about 300°C, generating usable steam.
- The cooled flue gas is then cleaned by scrubbers and electrostatic precipitators prior to discharge through the stack to the atmosphere.

The incinerator is fuelled by the energy content of the waste with the addition of fuel as required to maintain high temperatures. Combustion gases from the incinerator contain small amounts of certain contaminants and dust. Most of these materials are removed by a series of air pollution control devices. These devices include electrostatic precipitators and flue gas scrubbers, which can be "wet" or "dry" or a combination of both.

There are basically three types of material in the air emissions from an incinerator:

Figure 3. Rotary Kiln Incinerator

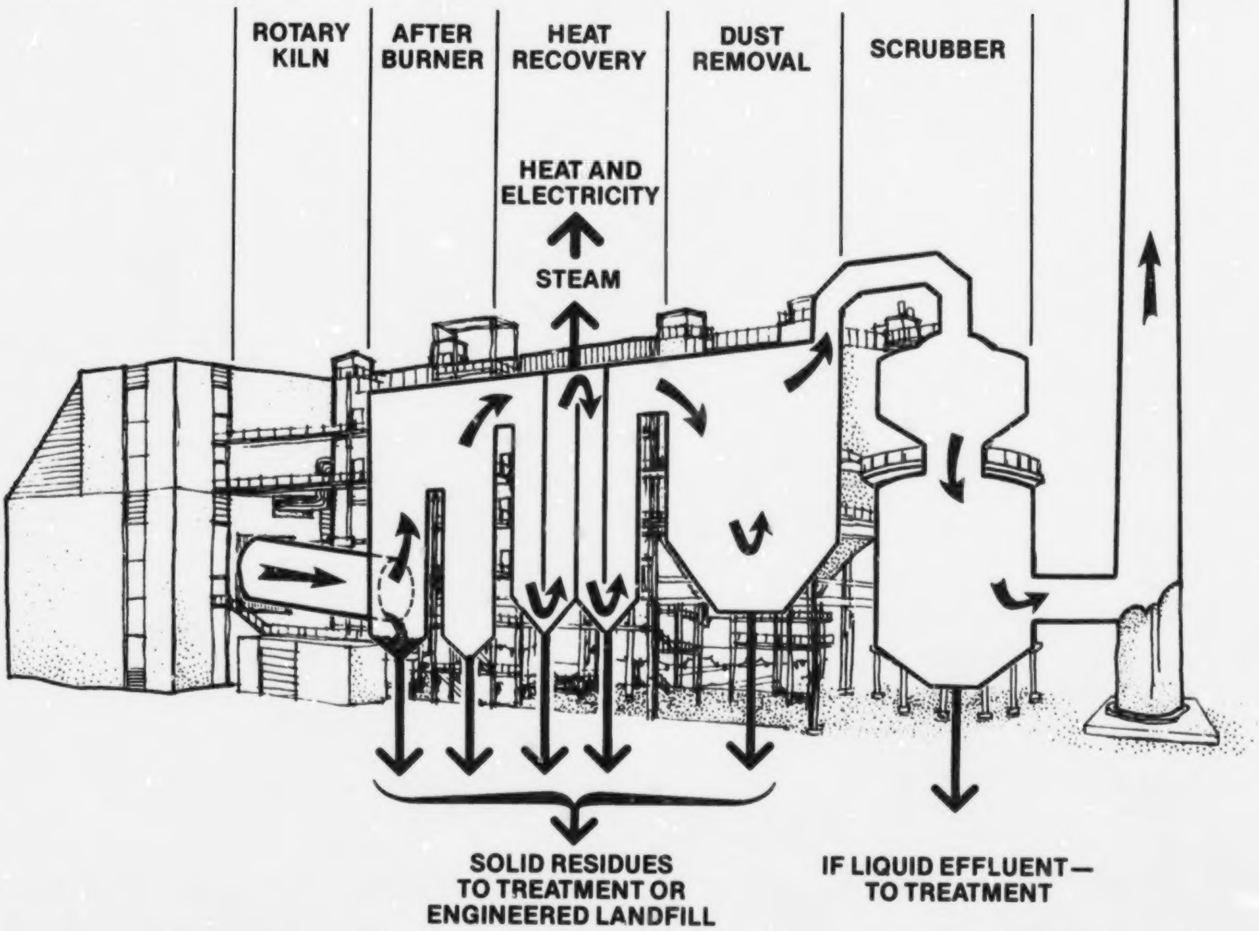
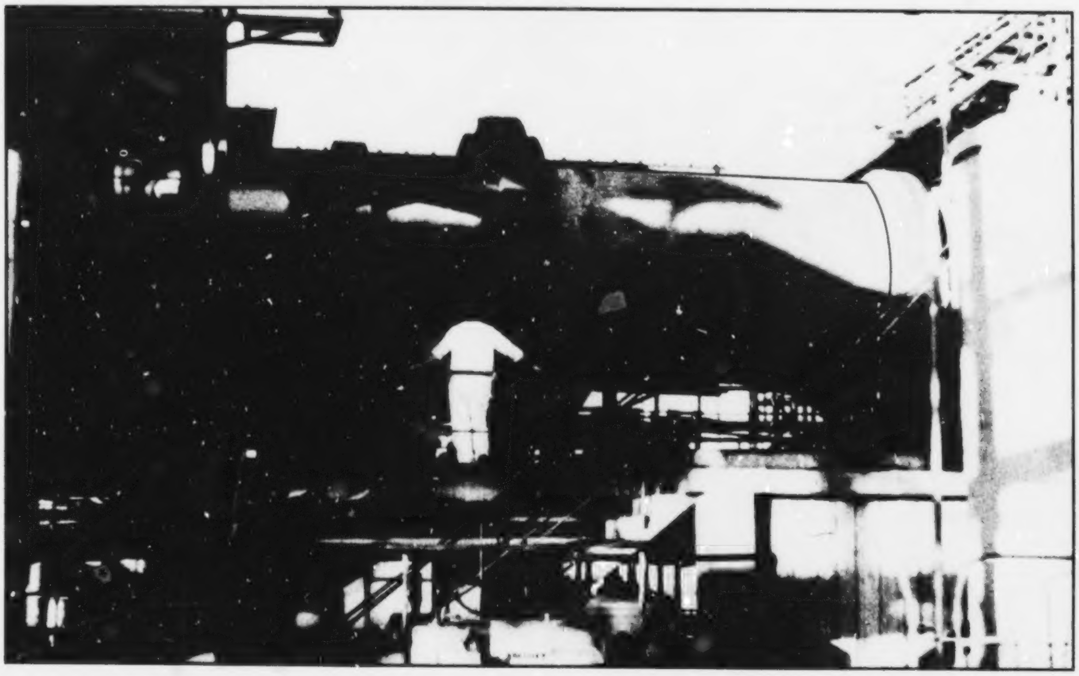

ROTARY KILN
AFTER BURNER
HEAT RECOVERY
DUST REMOVAL
SCRUBBER
HEAT AND ELECTRICITY
STEAM
SOLID RESIDUES TO TREATMENT OR ENGINEERED LANDFILL
IF LIQUID EFFLUENT— TO TREATMENT

Figure 4. A Rotary Kiln In Operation



Organic industrial wastes are incinerated in rotary kilns such as this one at a European waste treatment facility. (Photo courtesy Environment Canada)

- Particulate matter consisting of particles of inorganics (e.g. heavy metals and ash) which range in size from less than a micron (a human hair is about 100 microns thick) to the size of a large grain of sand.

- Combustion products including water vapour, carbon dioxide, nitrogen and sulphur oxides. The largest quantity of gas will be nitrogen (derived from the air), water vapour (derived from evaporated waste water and from burning waste and fuel), carbon dioxide (derived from burning waste and fuel) and oxygen (derived from the air); these gases are nontoxic, odourless and colourless.

- Residual organics. These materials will be very small in quantity, because approximately 99.98% destruction efficiency is achieved by an advanced incineration process.

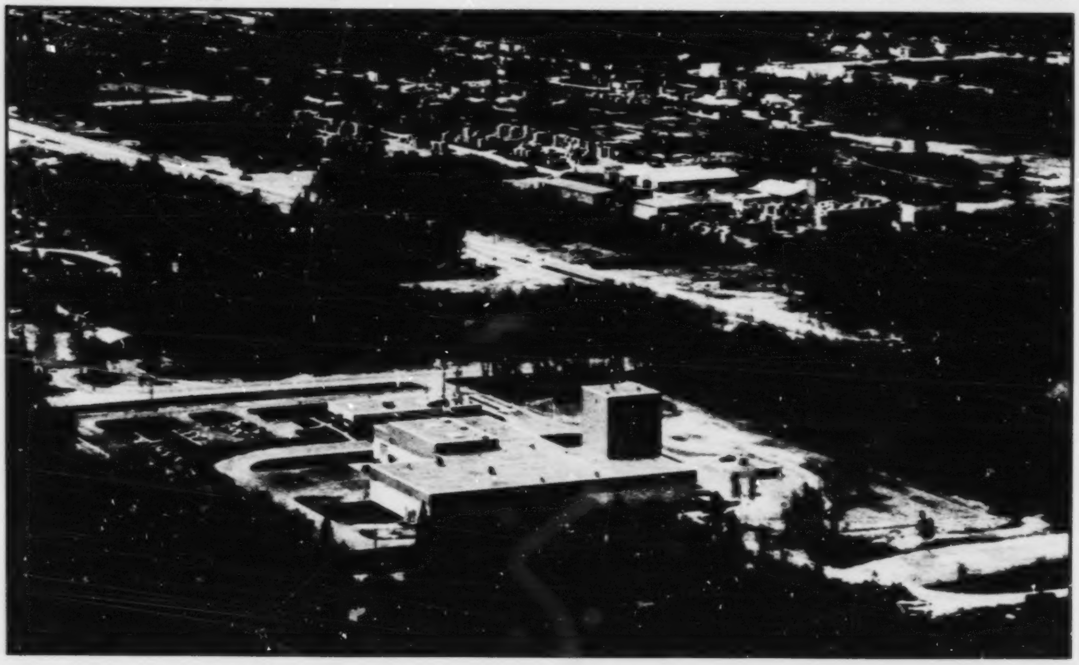
More detailed information on emission contents, regulations and control procedures is contained in the Questions and Answers section of the Appendix.

## Physical/Chemical Treatment

Several proven physical/chemical treatment processes are available that break down, detoxify and reduce the volume of most inorganic waste. Essentially, two types of processes are used. A physical process, such as filtration, separates contaminants out of the waste stream or changes the physical form of the waste stream. A chemical process, such as acid neutralization, alters the chemical composition of the waste stream. The combination of processes applied to a waste stream depends on its characteristics.

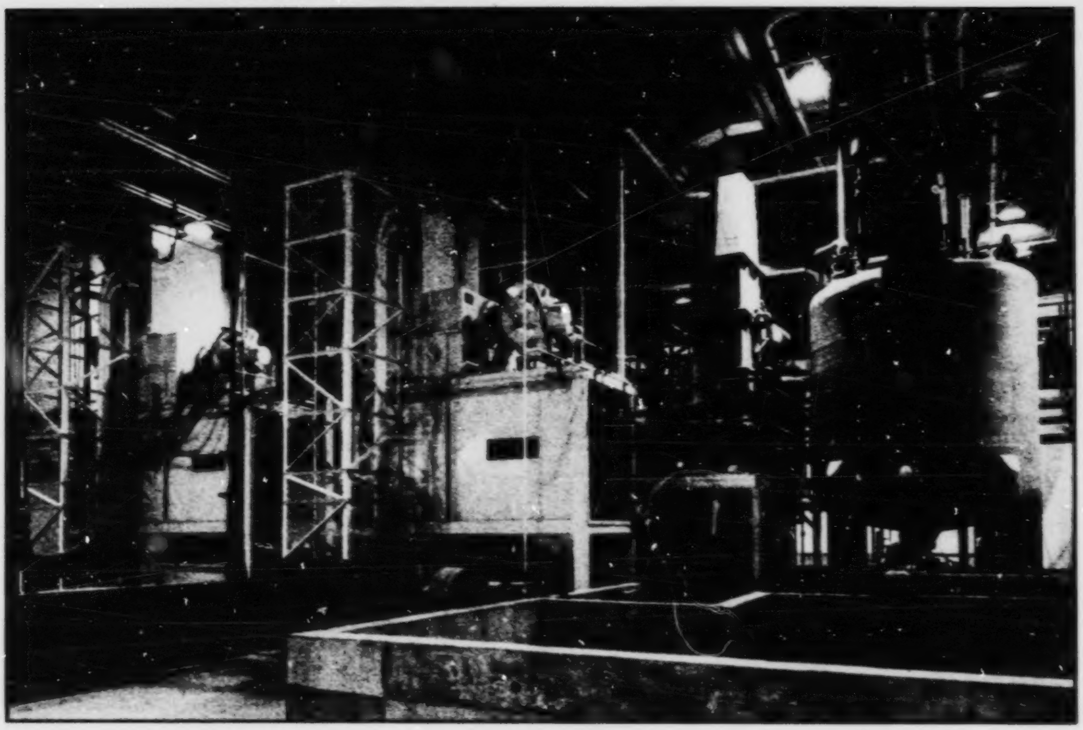
One type of physical/chemical treatment is solidification. Several solidification processes are available. They involve the addition of cement and/or other hardening additives to waste streams or treatment residues to produce a solid mass of low permeability. The use of a solidification process offers the possibility of solidifying all liquid effluents, thus eliminating any liquid discharge from the plant. It also could be used if required to improve the stability of waste residues before they are placed in an engineered landfill. However, with solidification the volume of waste

Figure 5. A Typical Physical/Chemical Treatment and Solidification Plant



Aerial view of Stablex Canada Inc. plant showing part of the community of Blainville, Quebec in the background. This plant provides physical/chemical treatment and fixation/solidification of inorganic wastes. All residues are formed into an environmentally safe and potentially useful concrete-like product which is deposited in an engineered landfill. (Photo courtesy of Stablex Canada Inc.)

Figure 6. An Interior View of a Physical/Chemical Treatment and Solidification Plant



Physical/chemical pre-treatment of inorganic wastes includes chemically transforming some wastes into less harmful substances. These reactions take place in closed vessels such as in the cyanide reactor unit, above. (Photo courtesy of Stablex Canada Inc.)

residues to be disposed of in the landfill could increase from 30 to 250 percent because of the bulking effect of these processes. Truck traffic volume could also increase.

The availability of solidification technology allows the physical/chemical treatment processes to be arranged in several options. The options that include solidification are as follows:

- Total solidification: With total solidification all waste residues and effluents are solidified. To render them suitable for solidification, they may be subjected to various pretreatment processes. Because no aqueous effluent is produced with total solidification, the polishing processes are unnecessary.

- Partial solidification: With the partial solidification option the volume of solidified residues for the landfill is less but an aqueous effluent is produced which requires disposal in a municipal sewage treatment system or a suitable receiving body of water.

In all options except total solidification, an aqueous effluent will be produced for discharge. In these options, the physical/chemical treatment facility would include polishing processes which would remove most of the remaining contaminants in the effluent and enable it to meet or exceed Ministry of the Environment guidelines. The amount of effluent which might be produced in partial solidification has not been determined precisely at this stage. Based on current estimates, a pipeline 10-15 cm in diameter would be required to carry this effluent to a discharge point. Acceptable effluents could be discharged directly into Lake Ontario or Lake Erie or through a suitable municipal sewage treatment facility to an acceptable receiving water body. (See Questions and Answers in the Appendix for a more detailed outline of the nature of these effluents and the treatment options available.)

OWMC will compare these options in more detail during Phase 4 prior to the selection of a specific solidification process.

## Landfill Options

### Introduction

The public frequently has expressed the concern that a landfill is not a reliable form of disposal for industrial wastes. Information on the escape of contaminants from a number of landfills in North America has sharpened this concern. However, many of these landfills have been accepting untreated waste and waste high in organic contaminants, have not been properly designed or engineered, and have not been sited where soils and other features of the local environment provide natural safeguards. OWMC's studies support the view that a landfill is reliable provided certain principles are adhered to in planning and operation.

OWMC uses the term "engineered landfill" when referring to its landfill options because all are based on the following principles to ensure their reliability:

- One of the first and most important principles adopted by OWMC's Board of Directors was that no waste would be placed in its landfill that had not been treated beforehand by the world's best available proven technology, to reduce its toxicity to a minimum and to make it as stable as possible over the long term. Full treatment of hazardous waste beforehand is critical to secure landfill disposal.

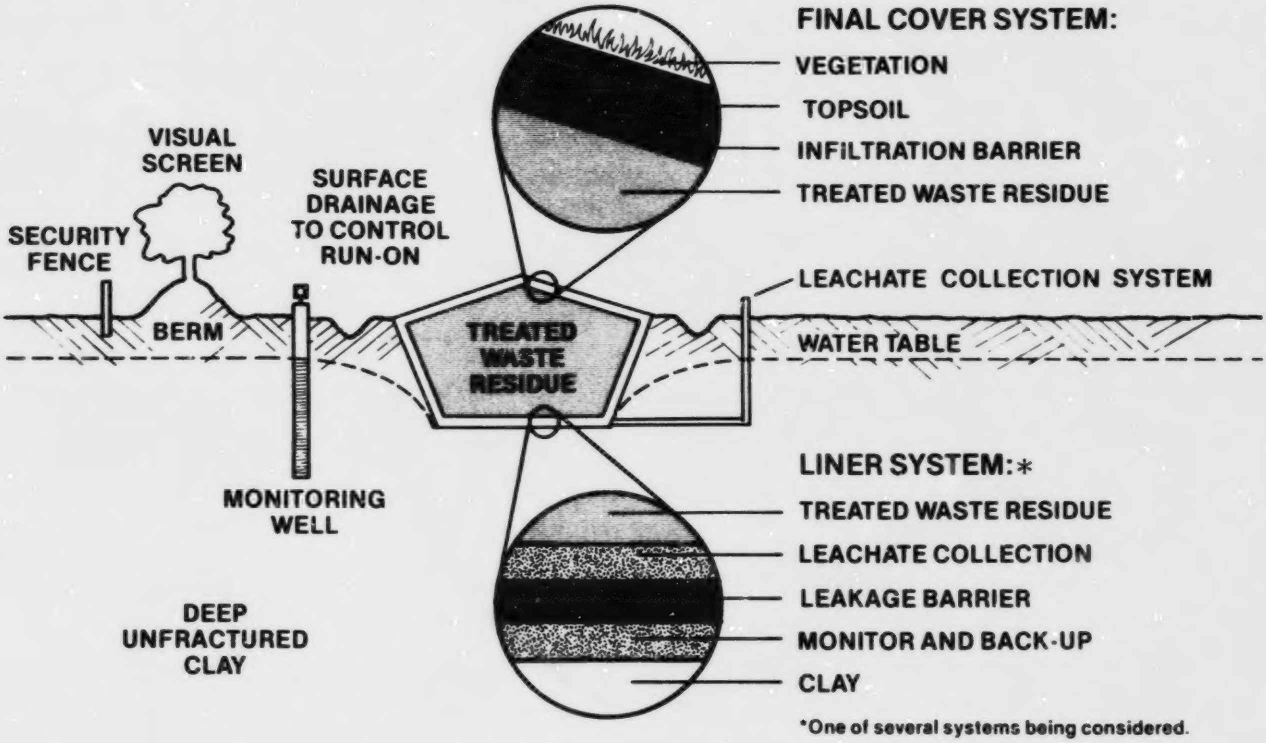
- The landfill design should contain certain engineering features which are illustrated in Figure 7:

  - a collection system that can be activated to remove any leachate that could potentially endanger ground and surface water resources;

  - a drainage control system to direct surface water away from the landfill;

  - during operation and after closure, a cover or cap of low permeability materials to restrict the entry of precipitation.

Figure 7. Standard Engineered Landfill


FINAL COVER SYSTEM:
VEGETATION
TOPSOIL
INFILTRATION BARRIER
TREATED WASTE RESIDUE
VISUAL SCREEN
SURFACE DRAINAGE TO CONTROL RUN-ON
SECURITY FENCE
LEACHATE COLLECTION SYSTEM
BERM
TREATED WASTE RESIDUE
WATER TABLE
LINER SYSTEM:*
TREATED WASTE RESIDUE
LEACHATE COLLECTION
LEAKAGE BARRIER
MONITOR AND BACK-UP
CLAY
MONITORING WELL
DEEP UNFRACTURED CLAY

*One of several systems being considered.

- In addition to the above protective measures, a monitoring system must be installed, and maintained after closure, to provide early warning of any leachate escapes so that remedial action can be taken.

- Even though the landfill will contain man-made safety and monitoring features, the choice of site must offer a natural safeguard as well, such as clay or clay/silt of low permeability.

In OWMC's view, a landfill that is designed, operated and sited on these principles will be a safe form of disposal for the residues of the treatment processes that will be used.

Three types of engineered landfill with the above features are being investigated by OWMC: standard, above-ground, and entombed.

Standard landfill: With the standard landfill, treated waste residues are placed in a relatively shallow excavation and mounded above ground. When a cell is full, a low-permeability cover is placed over the residues to minimize water infiltration.

If necessary, leachate produced within the landfill can be removed at the bottom by a drainage layer and collection pipes which lead to a sump. The sump may be pumped periodically and can be designed to alter leachate levels. A liner can also be constructed at the bottom of the excavation to isolate the residue from contact with the adjacent soils and the groundwater system. The landfill would be designed and operated using a cell-by-cell approach, allowing compatible residues to be stored and monitored in individual cells or compartments of the landfill. Figure 7 is a schematic drawing of the conditions that would exist shortly after completion of the landfill.

Above-ground landfills: In above-ground landfills, a relatively new concept, treated waste residues are placed above the ground surface using a liner and cover of low permeability. Any leachate produced from infiltration of precipitation through the top cover is collected continuously. The leachate drains to a holding tank where, after testing, it is removed for suitable treatment and/or discharge. (See Figure 8.)

Entombed landfill: In the entombed landfill, treated waste residues are placed in a deep excavation so that the top of the landfill is below the weathered (fractured) surface zone of clay where active groundwater movement may occur. Contaminant movement in unfractured fine-grained clay materials would be extremely slow - a few centimetres a year. However, a greater overall depth of clay is required to ensure an adequate depth of clay beneath the base of the landfill. A sketch of this concept is shown on Figure 9.

At present, the entombed landfill concept is OWMC's least favoured option. It may be impractical in view of the clay depths anticipated at the potential sites, and the bottom layer of clay could be damaged by upward water pressure during construction. At this time, the standard landfill concept appears the most advantageous, particularly for long term, post-closure maintenance. However, the final selection will be made when site studies have been completed and all hydrogeological, geological and engineering factors have been assessed in more detail.

## FACILITY OPERATIONS

In the planning and design of OWMC's treatment facilities, many aspects of their operation must be taken into account. Discussed here are safety and monitoring practices, the number of trucks entering the plant each day, and the use of buffer zones surrounding the plant.

### Safety and Monitoring Features

Proper plant design and operation will ensure the safe management of wastes from the time they enter the plant gate:

Figure 8. Above-Ground Engineered Landfill

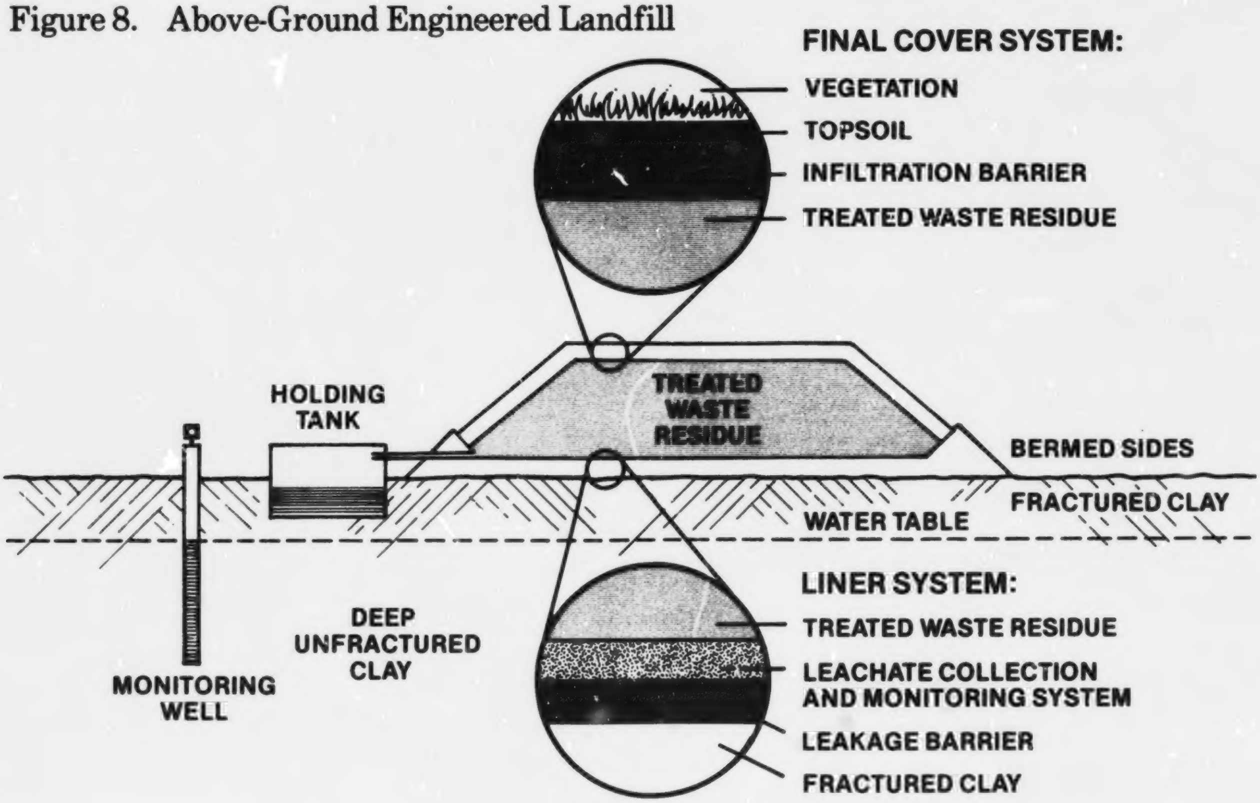
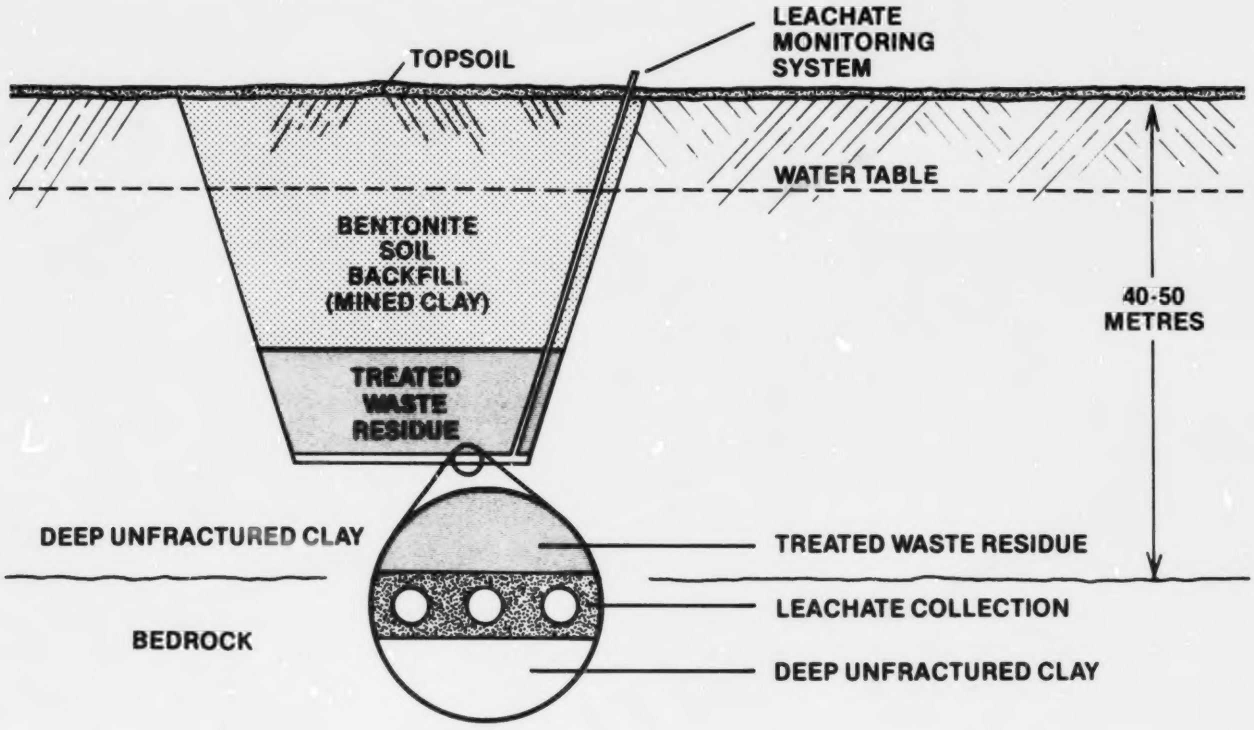

FINAL COVER SYSTEM:
VEGETATION
TOPSOIL
INFILTRATION BARRIER
TREATED WASTE RESIDUE
TREATED WASTE RESIDUE
HOLDING TANK
BERMED SIDES
FRACTURED CLAY
WATER TABLE
LINER SYSTEM:
TREATED WASTE RESIDUE
LEACHATE COLLECTION AND MONITORING SYSTEM
LEAKAGE BARRIER
FRACTURED CLAY
DEEP UNFRACTURED CLAY
MONITORING WELL

Figure 9. Entombed Engineered Landfill


TOPSOIL
LEACHATE MONITORING SYSTEM
WATER TABLE
BENTONITE SOIL BACKFILL (MINED CLAY)
TREATED WASTE RESIDUE
40-50 METRES
DEEP UNFRACTURED CLAY
BEDROCK
TREATED WASTE RESIDUE
LEACHATE COLLECTION
DEEP UNFRACTURED CLAY

- Waste generators wishing to send wastes to OWMC facilities will be required to provide representative samples to OWMC beforehand for detailed analysis prior to shipment.

- OWMC's laboratory will be equipped to carry out a comprehensive analysis and classification of these wastes, so that handling requirements and treatment methods can be determined ahead of actual delivery.

- No waste will be allowed to proceed to treatment until laboratory tests are conducted to ensure that the waste matches the manifest presented by the driver transporting the waste. If the waste does not match the manifest, this discrepancy must be resolved before the vehicle is permitted to enter the facility.

- Handling procedures will ensure that the waste is properly unloaded at appropriate storage tanks which will incorporate a drainage system for the collection of any spilled material. After unloading, all trucks will be required to pass through a wash to flush out any remaining waste in the truck. The wash water will be treated in the physical/chemical treatment plant or incinerated. Incompatible wastes will be stored separately in tanks when awaiting treatment.

- Control rooms at the incinerator and physical/chemical treatment plant will include systems designed to control and monitor every step of the treatment operation through the use of instrumentation and television displays.

- Contingency planning will be reflected in staff training in emergency procedures and the provision of appropriate emergency equipment.

## Truck Traffic

An estimate of the waste transport traffic generated by OWMC's facilities involves several considerations:

- the annual quantity of each type of waste to be handled;

- the annual quantities of non-waste treatment components such as reagents and additives;
- the extent to which rail and other non-truck transportation is used;
- the sizes of truck shipments and the degree of waste mixing permitted;
- whether highway transportation is required between treatment and disposal facilities, because these facilities are not integrated on a single site, and the residue volumes involved;
- how many days a year the facilities are in operation;
- whether or not there will be regional collection, bulking, or volume reduction facilities.

In view of these uncertainties, OWMC's planners are not yet in a position to provide firm estimates of truck volumes. However, preliminary estimates suggest that if OWMC facilities were treating 150,000 tonnes/year, transportation to the facilities could average more than 60 trucks a day.

## Buffer Zones

The possible impact of OWMC's facilities on existing and future nearby land uses has been an important consideration in site selection and facility planning. It has also been a concern frequently expressed through the public consultation program. Consequently, an examination is underway of the need for and nature of buffer zones or areas.

The size of any buffer zone will depend on the characteristics of the site and its surrounding area. OWMC's general intention is to acquire sites that provide adequate space beyond the operating area of the treatment facilities, to provide protection against and to monitor for any accidental releases of contaminants, so that appropriate containment action can be taken. This area of space around the operating area is called a technical buffer zone.

Whether a somewhat larger buffer zone is required depends on local conditions, although the site selection process has attempted to minimize potential conflicts with surrounding uses. For sites located outside heavy industrial areas, for example, it has been assumed that somewhat larger buffer areas will be needed to ensure that nearby uses are not affected by such nuisances as noise, odour and visual intrusion. There will also be a need to ensure that new land uses are not established in close proximity to the facility in a way that might lead to land use conflicts in the future. The determination of buffer and setback requirements and of the most appropriate means of implementing them will depend in large part on the concerns of government agencies, notably the Ministry of the Environment, and on the concerns and priorities of municipal representatives and local residents. Experiences with other facilities in other countries are being reviewed.

Preliminary planning estimates suggest a minimum technical buffer zone of 400 m around treatment facilities, except in heavy industrial areas where the need may be less. This estimate was applied in identifying potential sites (see Chapters 4 and 5) to minimize impacts on existing sensitive uses and features that would be in close proximity to the facility components. To assist in identifying the short list of candidate sites, environmental investigations were undertaken in areas extending 1000 m beyond the possible treatment facilities, and 500 m beyond the possible engineered landfills. Features abutting access roads were identified, while broader patterns of land use and population density were considered in areas within five kilometres of potential sites.

## ESTIMATES OF THE SIZE OF SITES

### Facility Arrangement Options

A major issue that affects site selection is how the three major waste treatment and disposal components can be grouped for siting purposes.

As described in the Phase 2 Report, the three facilities can be arranged in five variations:

Dispersed

1. separate incinerator
separate physical/chemical plant
separate landfill

Partially Integrated

| | | |
|---|---|---|
| 2. | incinerator<br>and<br>physical/chemical plant | with separate landfill |
| 3. | physical/chemical plant<br>and<br>landfill | with separate incinerator |
| 4. | incinerator<br>and<br>landfill | with separate physical/chemical plant |

Fully Integrated

| | | |
|---|---|---|
| 5. | incinerator and<br>physical/chemical plant<br>and landfill | all at one location |

Of these five major facility arrangement options, two are preferred by OWMC: Option 5, the fully integrated facility on a single site; and Option 2, the incinerator and physical/chemical facilities on one site with the landfill on a second site. Figure 10 is a conceptual design of the incinerator and physical/chemical facilities located on one site. These two facility arrangements appear to minimize both transportation costs, risks and environmental impacts as well as capital and operational costs. The public consultation workshop held in January 1984 tended to reinforce these conclusions while stressing the desirability of finding industrial locations for the incinerator and physical/chemical treatment components, if at all possible.

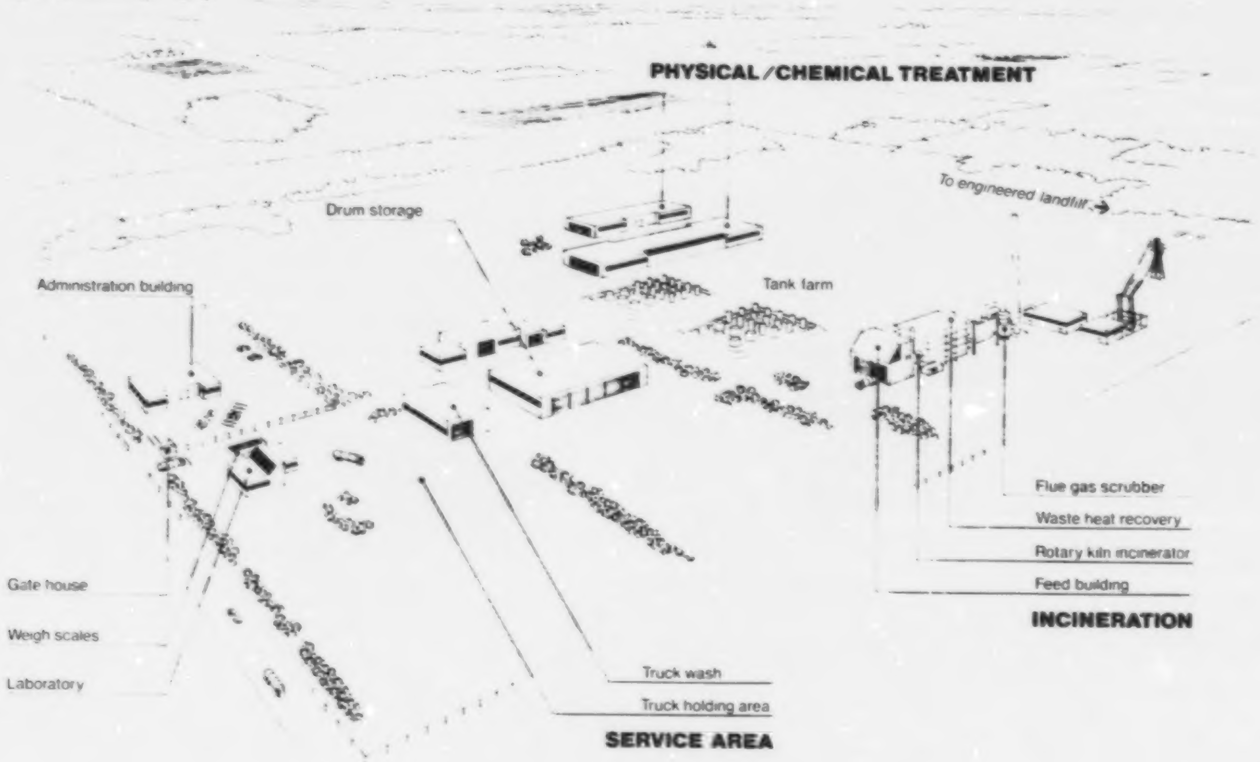


Figure 10. A Typical Industrial Waste Treatment Facility — Artist's Conception

PHYSICAL/CHEMICAL TREATMENT
To engineered landfill
Drum storage
Administration building
Tank farm
Flue gas scrubber
Waste heat recovery
Rotary kiln incinerator
Feed building
INCINERATION
Gate house
Weigh scales
Laboratory
Truck wash
Truck holding area
SERVICE AREA

**Site Sizes**

Based on an initial capacity of 150,000 tonnes/year of special waste, current waste quantity information indicates that about 30,000 tonnes would be organic waste and 120,000 tonnes inorganic waste. The physical/chemical treatment plant would be sized to process 50,000 tonnes/year of inorganic waste on a one-shift-per-day basis. Additional shifts would permit the plant to treat up to 120,000 tonnes/year of inorganic waste. The incineration plant would comprise one rotary kiln system sized to process 30,000 tonnes/year of organic waste on a three-shift-per-day basis.

Designing treatment facilities of this capacity, and a standard engineered landfill capable of receiving the treated residues from the incineration and physical/chemical treatment processes for two to three decades, would require the following minimum site sizes, all of which include a technical buffer zone:

- for a physical/chemical treatment plant or an incinerator, if located separately: 64 hectares (169 acres) each;
- for an incinerator and a physical/chemical treatment plant located together: 80 hectares (200 acres);
- for an engineered landfill located separately: 110 hectares (275 acres);
- for all three components located on one site (a physical/chemical treatment plant, an incinerator and an engineered landfill): 110 hectares (275 acres).

These estimates have been used in the selection of candidate sites.

# 4. The Site Selection Process

## INTRODUCTION

This chapter provides a general overview of the principles on which OWMC's site selection process was based, as an introduction to the more detailed description of the selection of candidate sites that follows in Chapter 5. This overview places the present site selection step in the context of the five-step process outlined in the Phase 2 Report (Figure 11). The chapter is in three parts:

- principles of site selection;
- the two previous steps;
- the present and two future steps.

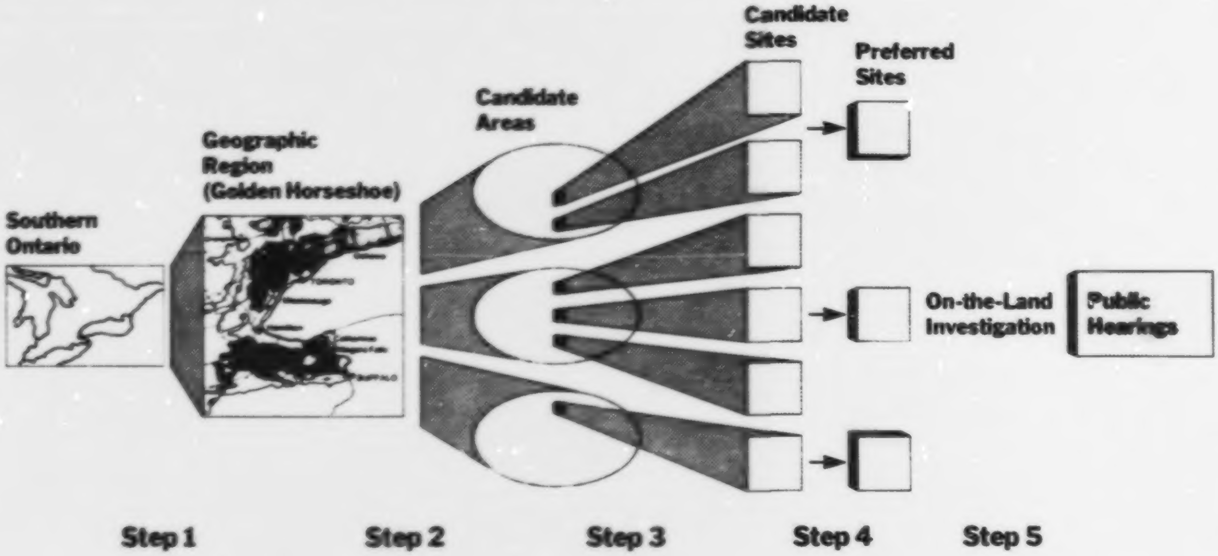
The next chapter describes in detail how the present step narrowed the search for sites to a short list of candidate sites.

## PRINCIPLES OF SITE SELECTION

In the Phase 3 Interim Report, OWMC outlined a number of general principles that guide the overall search process. These general principles are supplemented at each step in the process by more specific goals appropriate to that step.

Because of the regional scale of information used, particularly in the early stages of the process, OWMC recognized that the narrowing process could increase the probability but not ensure the certainty of finding suitable sites. Consequently, a working rule was adopted that no area or site deferred from further consideration in the selection process could be considered permanently excluded until the process was complete and the final site(s) approved.

Figure 11. A Step-by-Step Approach To Site Selection


Southern Ontario
Geographic Region (Golden Horseshoe)
Candidate Areas
Candidate Sites
Preferred Sites
On-the-Land Investigation
Public Hearings
Step 1
Step 2
Step 3
Step 4
Step 5

## General Principles of Site Selection

As described in the Phase 3 Interim Report, the following general principles have been identified as shaping the search process for sites:

- Progressive refinement of the search process: The process must move through a series of steps, which involve the evaluation of alternatives and the narrowing of geographic focus.

- Definition of the environment: The very broad and inclusive definition of the environment used in the Ontario Environmental Assessment Act (1975) has been adopted by OWMC. The environmental impact assessment process embodied in this Act also has been adopted by OWMC.

- Protection of human health and the environment: The primary consideration must be protecting human health and the environment.

- The involvement of those who might be affected: Agencies, organizations and people who might be affected must be consulted at key decision points in the process. OWMC is committed to a thorough consultation process.

- Efficiency and effectiveness of the process: The costs and time involved in conducting a detailed analysis and evaluation of every conceivable site across the entire province are prohibitive. The search and selection process must focus available resources systematically on critical concerns and reach definite conclusions as quickly as possible.

## THE TWO PREVIOUS STEPS

The point of departure for the present step was the completion of two previous steps in OWMC's site selection process that ended with the identification of candidate areas.

## STEP 1: Narrowing the Search to a Single Geographic Region in Ontario

The Phase 1 Report identified lands in Southern Ontario where the geological and hydrogeological conditions offer a higher probability of locating suitable sites for OWMC facilities. These lands were termed Zones 1 and 2, and OWMC determined that it would concentrate its search for sites in these zones.

The Phase 2 Report announced the results of Step 1 in the Search Process. Zones 1 and 2 within the geographic region of the Golden Horseshoe, an area at the west end of Lake Ontario where approximately 70% of Ontario's special waste is generated, were selected for further consideration (see Figure 12). These zones were considered generally to have more suitable geological and hydrogeological conditions for the natural containment of special waste. By focusing on these zones, a second natural level of protection, beyond that provided by engineering features designed in the facilities, would be built into the search and selection process.

## STEP 2: Identifying Candidate Areas Within This Region

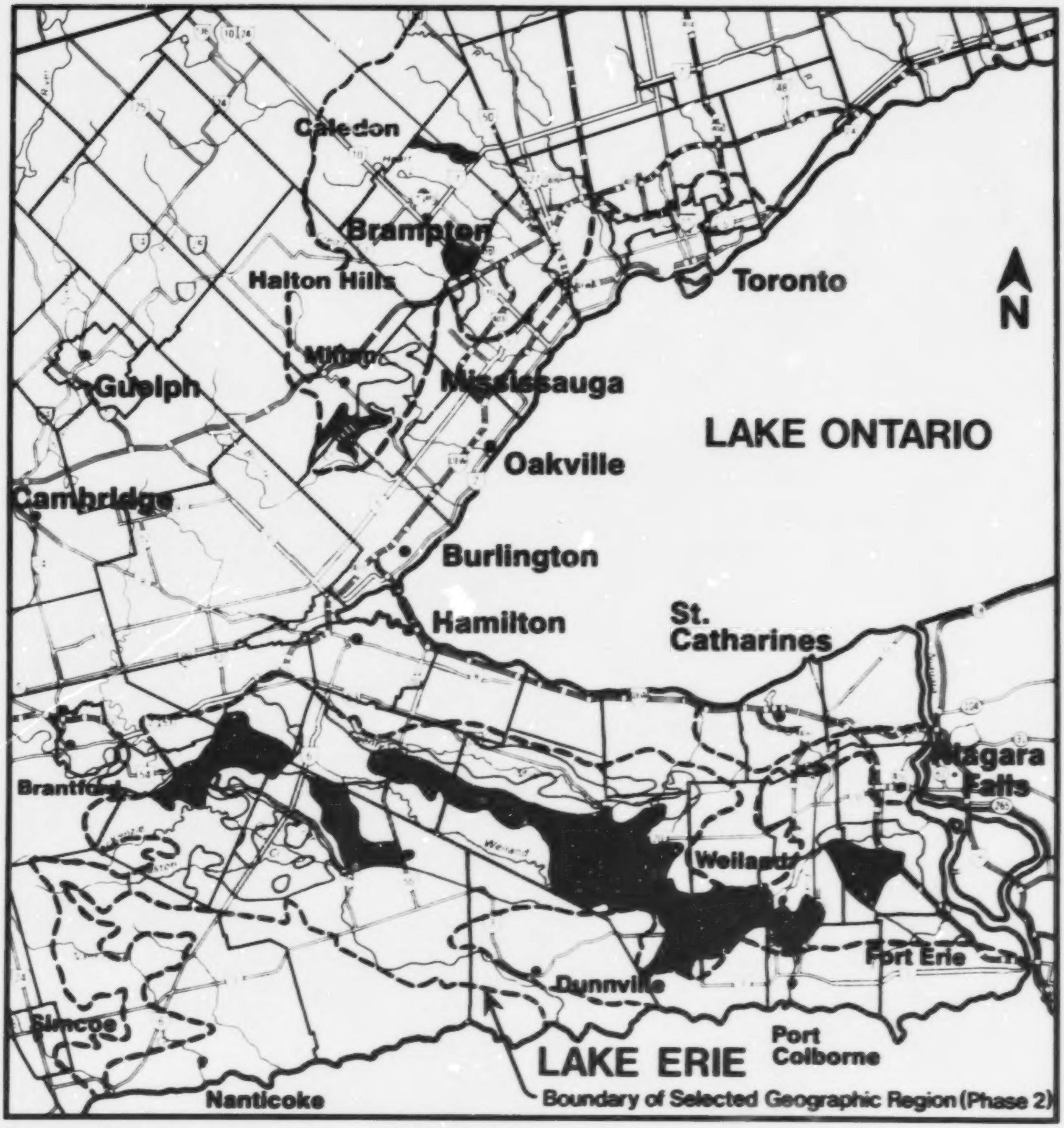
Phase 3 began with Step 2 of the site selection process: the identification of candidate areas within the zones mentioned above. Step 2 was described in the Phase 3 Interim Report of May 1983. The goals of this step were identified in that report as follows:

- A second natural level of protection of the environment beyond that provided for by the design and operating procedures of the facility component is essential.

- Likelihood of suitability. Because the factors addressed at this stage are at a broad regional scale, the suitability of a selected candidate area can be expressed at this stage only as a likelihood or probability of suitability, subject to later, more detailed investigations.

- The maintenance of choice. As decisions on exclusion are made, there must be the assurance at each step of the process that no significant or unique alternatives are being discarded.

Figure 12. Candidate Areas Within the Selected Geographic Region


Caledon
Brampton
Halton Hills
Toronto
N
Milton
Guelph
Mississauga
LAKE ONTARIO
Oakville
Cambridge
Burlington
Hamilton
St. Catharines
Niagara Falls
Brantford
Welland
Fort Erie
Dunnville
Simcoe
Port Colborne
LAKE ERIE
Nanticoke
Boundary of Selected Geographic Region (Phase 2)

**Legend — Components Included**

Source: Ontario Waste Management Corporation, March 1984

Miles 0 10 Kilometers 0 10

■ Physical/Chemical Treatment Plant Only

▨ Engineered Landfill & Physical/Chemical Treatment Plant

□ Physical/Chemical Treatment Plant & Incinerator

■ Integrated - All Components

Based on these goals, the selection process for Step 2 identified the candidate areas.

The Interim Phase 3 Report announced the results of the second step - the identification of candidate areas within the selected geographic region. Nineteen candidate areas within the Golden Horseshoe were identified on the basis of environmental, transportation and land use considerations. The Interim Report also stated that a more detailed hydrogeological analysis would be conducted in the area immediately north of Lake Ontario, stretching from Oshawa in the east to Brampton in the west, to ensure that any small parcels of suitable land, particularly industrially designated land, had not been overlooked in the preliminary exclusion of this large area. This analysis resulted in the identification of an additional, twentieth, candidate area in January 1984, which then was also included in the site selection process. (See Figure 12 for candidate areas.)

## THE PRESENT AND TWO FUTURE STEPS

### STEP 3: The Identification of Candidate Sites Within Candidate Areas

Step 3 of the site selection process was the identification of candidate sites. This step is described in Chapters 5 and 6 of this report.

The goals of Step 3 were based on the general principles of site selection and on the contributions from OWMC staff, consultants and the numerous seminars and discussions held with the general public, government agencies and professional associations. The three goals established for the selection of candidate sites, in order of importance, were as follows:

1. Minimize risk to human health.
2. Minimize environmental impacts.
3. Minimize financial costs to OWMC and the people of Ontario.

## 1. To minimize risk to human health

The design, construction, operations, monitoring and contingency planning associated with the facility components must ensure that the likelihood of the release of contaminants with human health consequences will be minimized. This first goal will be attained by such measures as:

- the minimization of the quantities of hazardous wastes that require treatment by encouraging reduction, recycling, exchange, and recovery;
- the use of the best proven treatment technologies;
- construction, operational and monitoring procedures including occupational health and safety guidelines.

No combination of engineering and operations measures, however, can reduce the potential for harm to human health to absolute zero. In the real world there will always remain the possibility of an accidental release of contaminants. Such a possibility has been and remains a primary public concern. In recognition of this concern, together with the commitment of OWMC to minimize risk to human health, the approach adopted has been to give this goal priority in the selection of candidate sites.

## 2. To minimize environmental impact

As explained in the Phase 3 Interim Report, the concept of the environment adopted by OWMC is extremely broad. It includes a diversity of biological, physical and natural resources, land use, land ownership and social and economic concerns and considerations. Potential impacts to be considered are not only those on and around the site, along the access routes and at discharge points for emissions and effluents but also those at a regional level and those with long-term as well as immediate effects. By identifying those features of the total environment most sensitive to the presence and operation of OWMC's facilities, the selection process for candidate sites must emphasize locations where such effects will be reduced to a minimum.

## 3. To minimize financial costs to OWMC

As a crown agency OWMC must spend public funds in the most efficient and effective manner possible.

With regard to the site selection process this includes the consideration of such potential areas of expenditure as: approvals, site acquisition, on-site development costs, off-site development costs and facility operation costs, including transportation costs.

Financial considerations will not outweigh risk and impact-related considerations. However, there may be instances where an insignificant reduction in risk or impact could have substantial financial implications for OWMC. It would be irresponsible for OWMC not to consider the financial implications of such choices.

In developing the selection process for candidate sites in Step 3, OWMC refined and elaborated these goals into a series of specific objectives (see Appendix). As described in the following chapter, 'factors' were then identified on which data were gathered and analyzed in the site selection process.

Step 3 in the selection process was itself subdivided into three basic narrowing stages, which are described in more detail in Chapter 5:

## 1. The Identification of Site Areas

In this first stage, smaller areas, called site areas, were identified within the larger candidate areas. To identify these site areas, data were first collected within the candidate areas on a long list of factors. Certain factors were then identified as "exclusionary" (i.e. factors which should rule out certain areas from further consideration at this time). These exclusionary factors were then mapped and certain areas excluded, and site areas free of those factors were identified. This technique, called constraint mapping, resulted in the identification of a large number of potentially suitable site areas for examination in greater detail.

### 2. The Identification of Potential Sites Within These Areas

The next stage involved "screening" the site areas and further reducing them in size and number using additional factors to identify a long list of potential sites.

### 3. Comparison of Potential Sites and Identification of Candidate Sites

The final stage compared the potential sites, using even more factors, and then reduced them to a short list of candidate sites.

An extensive discussion of these three stages and a description of the candidate sites that resulted are presented in the next two chapters.

## STEP 4: Comparison of Candidate Sites and Identification of Preferred Site(s)

With the identification of candidate sites the next step is about to begin. Chapter 7 of this report describes the planning that is underway for a detailed comparative evaluation of the candidate sites. Based on comprehensive environmental investigations and analyses of the sites and their localities, combined with further information on expected waste types and quantities and on facility requirements, and with the issues raised being reviewed in public consultation, it will be possible to choose a site, or a set of sites, that seems most likely to be suitable.

## STEP 5: Detailed Testing of Preferred Sites

The fifth and final step will consist of selective on-the-land investigation of the environmental suitability of the selected site(s) from all points of view. The documentation developed at this stage - and all previous stages - will be presented in due course for scrutiny by the Hearing Panel.

# 5. The Identification of Candidate Sites

## INTRODUCTION

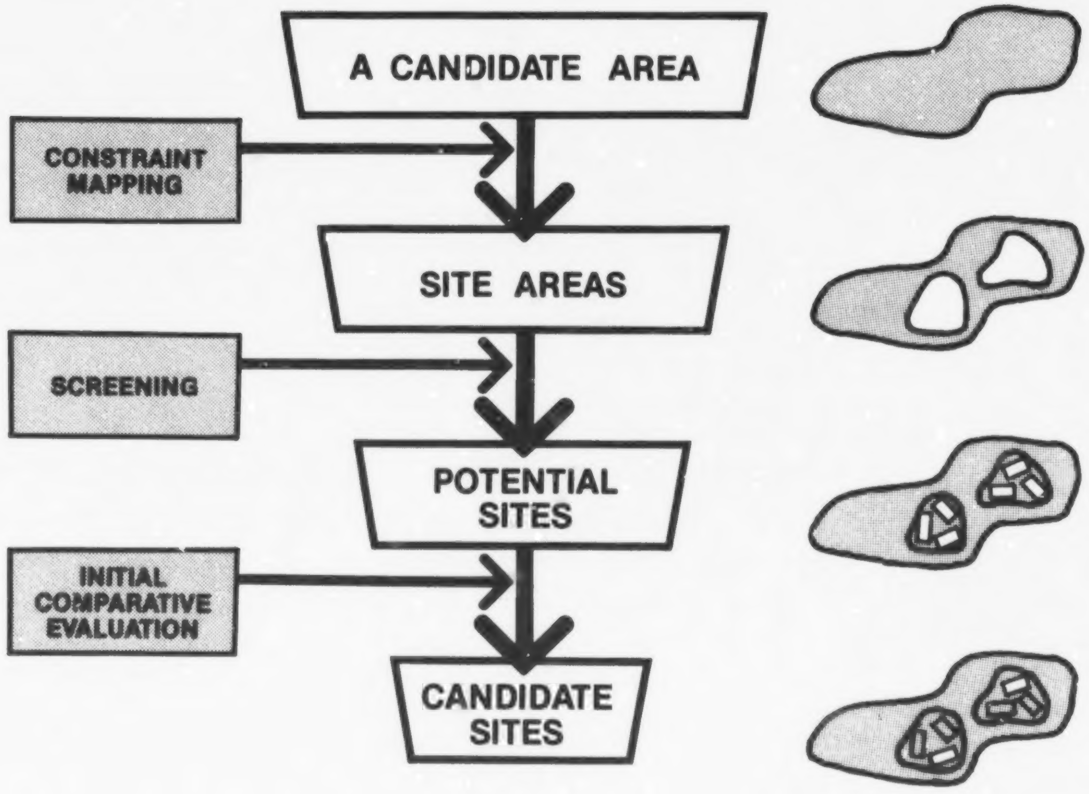
This chapter describes the way in which close examination of the candidate areas led to the identification of candidate sites. The process incorporated the estimates on the size and characteristics of facilities that were discussed in Chapter 3 and applied the principles and goals outlined in Chapter 4. The concerns and priorities of government agencies, private organizations and interest groups, as discussed in Chapter 2, were also considered.

As mentioned in Chapter 4, the process of selecting candidate sites from within candidate areas was divided into three major stages (see Figure 13):

- The identification of site areas by setting aside those parts of the candidate areas that appear to be less suitable.
- The identification of specific potential sites within these site areas.
- The comparison of these potential sites and the setting aside of some to produce a short list of candidate sites.

This chapter outlines these three stages. Greater detail on the data collected and their analysis is contained in the Appendix to this report.

Figure 13. The Selection of Candidate Sites


A CANDIDATE AREA
CONSTRAINT MAPPING
SITE AREAS
SCREENING
POTENTIAL SITES
INITIAL COMPARATIVE EVALUATION
CANDIDATE SITES

## THE SELECTION PROCESS

### 1. The Identification of Site Areas: Constraint Mapping

#### a) The Process

The first stage in the selection of candidate sites began by focussing on the candidate areas announced last May. Within these areas many regions and tracts were considered on close examination to be less suitable for the location of any of the three facility components - an engineered landfill, a physical/chemical treatment plant and an incinerator. When those lands were excluded by a mapping technique called constraint mapping, what remained were described as site areas, of many shapes and sizes.

The environmental factors taken into account in this first stage reflected the principles and goals of site selection in Phase 3 developed with the assistance of the public consultation program. In particular, the factors represented the following objectives:

- the need to provide a second level of environmental protection to inhibit the off-site movement of contaminants;
- the need to minimize impact on agricultural resources;
- the need to minimize adverse effects on community facilities;
- the need to ensure land use compatibility and the particular desirability of using publicly held and/or industrially designated lands, if possible.

Once the site area factors supporting these objectives were identified, an intensive process of data collection, analysis and mapping was undertaken. This process resulted in the preparation of 88 maps.

The next step was to decide which factors should be treated as "exclusionary" and which factors should not. An exclusionary factor is one which, when mapped, would identify areas considered unsuitable for a given facility component (e.g. residential areas). Table 5.1 lists all these factors. A more detailed outline of the factors is contained in the Appendix.

Once decisions were reached regarding the treatment of the factors, two sets of maps were prepared. One set of maps identifies potentially suitable areas for a landfill or a fully integrated facility. The other set of maps identifies areas suitable for an incinerator, a physical/chemical treatment plant, or an incinerator together with a physical/chemical treatment plant.

The next step was to decide which factors should be treated as "exclusionary" and which factors should not. An exclusionary factor is one which, when mapped, would identify areas considered unsuitable for a given facility component (e.g. residential areas). Table 5.1 lists all these factors. A more detailed outline of the factors is contained in the Appendix.

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### b) The Results

This stage in the process resulted in the identification of 65 landfill/integrated site areas and 87 physical/chemical treatment and incinerator site areas. These areas are identified in Figures 14 and 15 (large maps enclosed).

At the outset it is important to explain the site classification system used throughout this chapter, and on the enclosed maps.

## TABLE 5.1

## Constraint Mapping Factors

**Factors marked X identify areas unsuitable for given facility components. Factors marked 0 were judged not to rule out the given components at this stage**

| | All Facility Components |
|---|---|
| Physical Resources | |
| • surface granular soils | X |
| • significant stream courses | X |
| • flood plain areas | X |
| • wetlands | X |
| • drumlins (Niagara) | X |
| • morainal features | X |
| • till and lacustrine clay plain | 0 |
| • drumlins (Halton) | 0 |
| • poor surface drainage | 0 |
| Biological Resources | |
| • significant environmental units (SEUs)* | 0 |
| • non-SEU woodlots greater than 20 ha in area | 0 |
| Land Use | |
| • Indian Reserves | X |
| • residential built-upon | X |
| • residential, designated and serviced | X |
| • commercial, designated and built-upon | X |
| • commercial, designated and vacant | X |
| • existing rural residential | X |
| • industrially designated and vacant | 0 |
| • rural designated | 0 |
| • industrially designated and serviced | 0 |
| • industrially designated built-upon | 0 |
| • residual, Regional Official Plan | 0 |
| • residential designated and vacant | 0 |
| • provincial planning designation | 0 |

*Areas identified by provincial and/or municipal agencies as environmentally sensitive or significant.

## TABLE 5.1

## Constraint Mapping Factors

| | All Facility Components |
|---|---|
| **Recreation and Community Facilities** | |
| ● hospitals | X |
| ● homes for the aged | X |
| ● colleges and universities | X |
| ● nursing homes | X |
| ● special educational facilities | X |
| ● police headquarters | X |
| ● theme parks | X |
| ● regional shopping centres | X |
| ● correctional facilities | X |
| ● institutions for the handicapped | X |
| ● golf course | 0 |
| ● campgrounds | 0 |
| ● museums | 0 |
| ● fairgrounds and exhibitions | 0 |
| ● municipal, regional and private parks | 0 |
| ● conservation areas | 0 |
| ● municipal sports facilities | 0 |
| ● private sports facilities | 0 |
| **Transportation** | |
| ● airports | X |

## TABLE 5.1

## Constraint Mapping Factors

**Factors marked X identify areas unsuitable for given facility components. Factors marked 0 were judged not to rule out the given components at this stage**

| | Fully integrated or landfill | Physical/chemical treatment plant and incinerator |
|---|---|---|
| Agriculture | | |
| • existing specialty crops | X | X |
| • class 1 and 2 row crops and corn wheat* | X | X |
| • class 1 and 2 mixed, cereal grain and hay grain* | X | X |
| • class 3 row crops and corn wheat* | X | X |
| • class 3 mixed, cereal grain and hay grain* | 0 | X |
| • class 1 and 2, hay and grazing* | 0 | X |
| • class 4 row crops and corn wheat* | 0 | X |
| • class 4 mixed, cereal grain and hay grain* | 0 | X |
| • class 5 and lower | 0 | 0 |
| • class 3 and 4 in non-agricultural use | 0 | 0 |
| • class 1 and 2 in non-agricultural use | 0 | 0 |
| • class 3 and 4 hay and grazing | 0 | 0 |

*Except for areas within industrially designated or publicly owned lands, urban shadows and short haulage distance, where this factor is non-exclusionary.

## TABLE 5.2

## Initial Comparative Evaluation Factors

A. SITE

1. Human Environment

   - existing residences
   - existing resources (agricultural, historical, archaeological, groundwater)
   - existing community and recreational facilities (public, private)
   - existing commercial and industrial uses
   - future residents
   - future resources
   - future commercial and industrial uses

2. Physical and Biological Environment (site and site vicinity)

   - hydrogeology
   - biology
   - atmospheric dispersion

3. Costs/Operations

   - land acquisition
   - site improvements
   - utilities, roads, airports
   - site size and configuration

B. SITE VICINITY

1. Human Environment

   - existing residences
   - existing resources
   - existing community and recreational facilities
   - existing community character and lifestyle
   - future residents
   - future resources
   - existing commercial and industrial uses
   - future commercial and industrial uses

2. Costs/Operations

   - proximity to sewage treatment plants/receiving bodies
   - proximity to rail access

## TABLE 5.2

## Initial Comparative Evaluation Factors

C. ACCESS ROAD - LOCAL

1. Human Environment

- transportation safety
- existing residents
- existing resources
- existing community and recreational facilities
- future residents
- future resources
- existing commercial and industrial uses
- future commercial and industrial uses

2. Physical and Biological Environment

- hydrogeology
- stream crossings

D. ACCESS ROAD - REGIONAL

1. Human Environment

- transportation safety
- existing residences
- existing resources

2. Physical and Biological Environment

- hydrogeology
- stream crossings

3. Costs/Operations

- tonne kilometres of waste and solidification additives hauled e.g. LF-2N, P1-2W

LF refers to a site which may be considered suitable for a fully integrated facility, a landfill. or a landfill in combination with a nearby physical/chemical treatment plant and incinerator.

PI refers to a site for a physical/chemical treatment plant, or an incinerator or a combined physical/chemical treatment plant and incinerator.

2 is a sequential number assigned to the site when it was identified earlier in the process.

N or W refers to the site's geographic location (N=north, W=west, C=central, E=east) in relation to the western end of Lake Ontario.

## 2. The Identification of Potential Sites: Site Screening

### a) The Process

The second stage reduced the site areas in number and size to potential sites. It involved the collection of detailed data on each site area and the application of certain "screening" factors.

During the screening process, site areas were either dropped from further consideration or reduced in size. The screening factors addressed the following questions:

i) **Are there areas which are too small or unsuitably shaped to accommodate the size of facility required? (Site Size and Configuration Screen)**

The first step in the screening process was to set aside site areas which were much too small or which were characterized by narrow, irregular configurations which could not be developed properly for the planned facilities.

ii) **Are there areas which are crossed by major services? (Suitability Screen - Linear Facilities)**

The site areas which remained were then examined in terms of major services such as major roads, railways, hydroelectric transmission corridors and other major trunk utilities. Only services which would severely restrict site development were considered. The analysis served in some cases to reduce site areas in size. If the remaining parcels were too small, they were excluded.

iii) **Are there areas which are less suitable because they contain very sensitive environmental areas? (Significant Environmental Units (SEUs) as identified by provincial and/or municipal agencies)**

The occurrence of designated Sensitive Environmental Units on individual areas led to the reduction in size of some site areas and the rejection of others. Site areas were retained if only a small portion of an environmental area would be affected or if the significance of the environmental resources was uncertain.

iv) **Are there areas which are unsuitable because they would result in severe environmental or social impacts? (Suitability Screen - Severe Impacts)**

Some site areas were set aside because of clearly unsuitable conditions such as the following:

- physical conditions, e.g. floodplain lands;
- major community facilities on site or in the immediate vicinity;
- major commercial and industrial uses on the site which would be extremely difficult to relocate;
- major population concentrations and/or residentially designated land in the immediate vicinity;

- basic conflict between facility components and nearby transportation facilities, e.g. an airport.

v) **Are there areas which have a number of constraints and no relative advantages over the site areas which could be retained? (Suitability Screen - Relative Suitability)**

In many cases, the site areas which remained at this point were characterized by a number of constraints which individually could not eliminate the site area from further consideration but collectively could be considered sufficient for site rejection.

vi) **Are there areas for a combined physical/chemical treatment plant and incinerator in particular that would mitigate potential impacts on agriculture and/or are in industrially designated areas? (Compatibility Screen)**

A physical/chemical treatment plant and an incinerator have many of the characteristics of medium to heavy industrial uses. Through the public consultation program a strong preference was expressed for industrial areas as locations for the incinerator and physical/chemical treatment plants. Particular importance was also attached to minimizing the impacts of these facilities on agriculture. For these reasons, it was concluded that a partially integrated facility should only be considered in the following circumstances:

- a landfill site could not be developed as a fully integrated site (for example, if proximity to an airport imposes height restrictions on the incinerator stack);

- if impacts on agriculture could be reduced by locating the physical/chemical treatment plant and the incinerator apart from the landfill and in an industrial or, failing that, an "urban shadow" area.

vii) **Are there site areas for a combined incinerator and physical/chemical treatment plant which should be eliminated because they are too far from selected landfills? (Systems Screen)**

One of the major potential impacts associated with a partially integrated facility is the additional noise and disturbance resulting from transportation between facility components. To minimize these impacts preference was given to site areas which were closer to landfills and/or which had fewer sensitive uses, such as houses, along the access roads between the facility components.

### b) The Results

This stage in the process resulted in the identification of 16 potential sites: ten landfill sites and six sites for a combined physical/chemical treatment plant and incinerator. Of the ten landfill sites, two were considered as landfills only and eight were considered suitable as either landfills or as fully integrated sites. All these sites are identified in Figure 16 contained in this report. A more detailed outline of these sites is contained in the Appendix.

## 3. From Potential Sites to a Short List of Candidate Sites (Initial Comparative Evaluation)

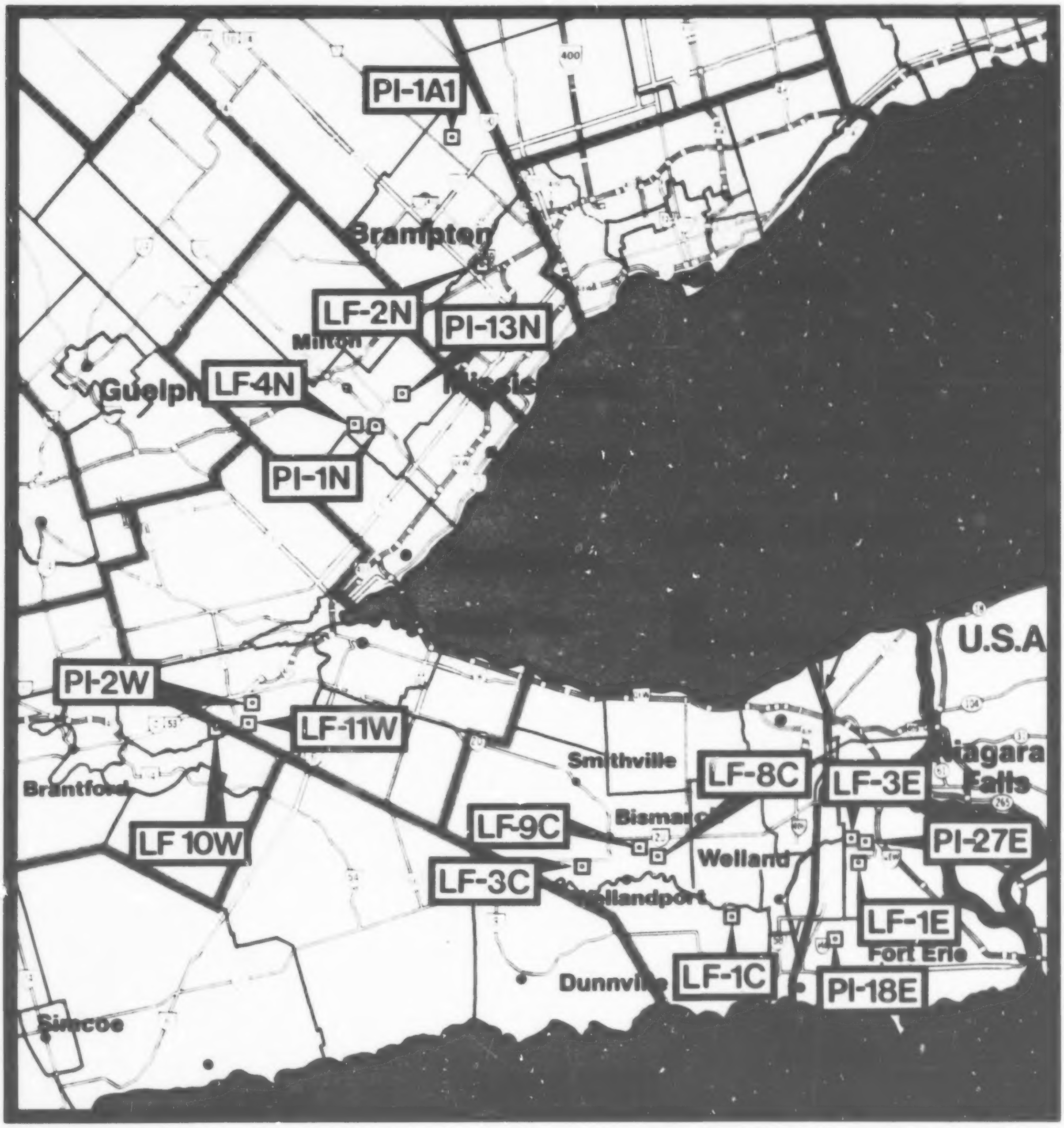
### a) The Process

This stage reduced the list of potential sites to a short list of candidate sites, using the factors identified in Table 5.2. The factors encompass a range of physical, social, resource, biological, land use, transportation and cost considerations for each potential site, the area around each site and the access roads to the sites.

In this stage, a number of important issues emerged in which trade-offs were required. These issues were discussed at a public workshop held in January 1984 and are summarized in Chapter 2 of this report.

Detailed tables specifying the relative differences among the siting options were then combined into an overall picture of the major constraints and opportunities associated with each site. The major characteristics among the siting options are highlighted in the Appendix.

Figure 16. Potential Sites — From Which Candidate Sites Were Selected


400
PI-1A1
Brampton
LF-2N
PI-13N
Milton
Guelph
LF4N
Mississ
PI-1N
U.S.A
PI-2W
LF-11W
Smithville
LF-8C
LF-3E
Niagara Falls
Brantford
Bismarck
LF-9C
PI-27E
LF 10W
Welland
LF-3C
Wellandport
LF-1E
Fort Erie
Dunnville
LF-1C
PI-18E
Simcoe

## Legend

▣ Potential Site

▬ Regional Municipal & County Boundaries

— Township, Town & City Boundaries

**LF** Landfill

**PI** Physical/Chemical Treatment Plant & Incineration

Source: Ontario Waste Management Corporation. March, 1984.
Note: Symbols indicate location only, and not size or shape of sites.

| Site Name | Landfill | Physical/ Chemical | Incinerator | |
|---|---|---|---|---|
| LF-2N | • | • | | |
| LF-4N | • | • | | |
| LF-10W | • | • | • | Integrated |
| LF-11W | • | • | • | Integrated |
| LF-1C | • | | | |
| LF-3C | • | • | • | Integrated |
| LF-8C | • | • | • | Integrated |
| LF-9C | • | • | • | Integrated |
| LF-IE | • | • | • | Integrated |
| LF-3E | • | • | • | Integrated |
| PI-1A1 | | • | • | |
| PI-1N | | • | • | |
| PI-13N | | • | • | |
| PI-2W | | • | • | |
| PI-18E | | • | • | |
| PI-27E | | • | • | |

The process by which the 16 potential sites were reduced to 8 candidate sites involved site-by-site comparison of more detailed information on the factors in Table 5.3.

The comparative analysis of the potential sites addressed the following three questions:

i) **Did the additional investigations identify major constraints sufficient to remove some potential sites from further consideration at this time?**

Only two sites, LF-3E and PI-2W, were determined to be unacceptable at this point. The additional investigations determined that site LF-3E in Niagara Falls had a higher probability of being hydrogeologically unsuitable as a landfill than the others. After discussions with Transport Canada, it was also concluded that the location of PI-2W in proximity to Hamilton Civic Airport would pose an unacceptable hazard to airport operations.

ii) **In comparing the differences among the potential sites, were there sites that were relatively less suitable which could be dropped from further consideration at this time without seriously limiting the diversity of siting choices for Phase 4?**

Five sites - LF-10W, LF-11W, PI-18E, LF-1C and LF-8C - were determined to have major relative disadvantages and no major advantages over the siting options retained.

iii) **Were there sites which possessed major disadvantages with respect to the top-ranked goal - i.e. minimizing risk to human health - such that the site could not be expected eventually to be the preferred site?**

Two sites, LF-4N (integrated) and PI-1A1 were determined to be unsuitable with respect to this question. As noted in Chapter 4, the likelihood of an accidental release is extremely remote.

However, it was also recognized that, to the maximum extent possible, the site selection process should be shaped to further minimize risk to human health.

The primary "pathway" to the environment which might occur with the incinerator/physical chemical treatment facility components is an airborne release. Site LF-4N, as an integrated site, is the most constrained site with respect to air dispersion because of its proximity to the Niagara Escarpment. (This conclusion confirmed the preliminary conclusions outlined in the Interim Phase 3 report.) Site PI-1A1 was determined to be the most constrained site with respect to sensitive receptors (e.g. residential areas) because of the very high resident population levels in the region surrounding the site. Site PI-1A1 had a number of additional constraints, notably very high land values and proximity to future residential areas. And, finally, its proximity to the Lester B. Pearson International Airport caused some concern on the part of Transport Canada.

b) The Results

This analysis led to the reduction in the number of potential sites to the 8 candidate sites listed on page 67. They are outlined in more detail in Chapter 6. (See Figure 17. Figure 18 is a larger-scale map depicting the location of the 8 candidate sites.)

| Site No. | Location | Facility |
|---|---|---|
| LF-2N | City of Mississauga (Lots 9 and 10, Concession 1 E.H.S., former Township of Mississauga, City of Mississauga) | Landfill only or Landfill and Physical/Chemical Treatment Plant |
| LF-4N | Town of Milton (Part of lots 6, 7 and 8, Concession 7, former Township of Nelson, Town of Milton) | Landfill only or Landfill and Physical/Chemical Treatment Plant |
| PI-1N | Town of Milton (Part of lots 3, 4 and 5, Concessions 1 and 2, former Township of Trafalgar, Town of Milton) | Physical/Chemical Treatment Plant and/or Incinerator |
| PI-13N | Town of Milton (Lots 3 and 4, Concession 6, former Township of Trafalgar, Town of Milton) | Physical/Chemical Treatment Plant and/or Incinerator |
| LF-3C | Township of West Lincoln (Part of lots 5, 6 and 7, Concession 1, former Township of Gainsborough, Township of West Lincoln) | A Fully Integrated Facility (i.e. Landfill, Physical/Chemical Treatment Plant and Incinerator) or Landfill only |
| LF-9C | Township of West Lincoln (Part of lots 17 and 18, Concession 3, former Township of Gainsborough, Township of West Lincoln) | Fully Integrated Facility or Landfill only |
| LF-1E | City of Niagara Falls (Lots 5, 6 and 7, Concessions 2 and 3, former Township of Crowland, City of Niagara Falls) | Fully Integrated Facility or Landfill only |
| PI-27E | City of Niagara Falls (Part of lots 1, 2, 3 and 4, Broken Front Concession, former Township of Crowland, City of Niagara Falls) | Physical/Chemical Treatment Plant and/or Incinerator |

# 6. The Candidate Sites

## INTRODUCTION

This chapter contains a brief description of the candidate sites. Following a detailed comparative evaluation in Phase 4, one or two of these sites will be selected as the preferred site or sites. This chapter outlines some of the particular features of each site which will be examined in Phase 4. In addition, issues undoubtedly will be identified as a result of detailed field investigations and further discussions with municipal officials and local residents.

## GENERAL CHARACTERISTICS

As noted in Chapter 5, the site selection process has reduced the number of siting options to 3 fully integrated and 5 partially integrated options (see Table 6.1). In all, a total of 8 parcels of land scattered across the candidate areas are being carried forward into the next step of the search process. (See Figure 17. A larger scale map depicting these locations - Figure 18 - appears at the end of this chapter.)

The 8 sites are of varying sizes, which is partly the result of existing land ownership patterns. In other cases, somewhat larger areas are shown than will actually be required because there is a need for more detailed investigations and discussions with municipal representatives and local landowners before the site boundaries can be finalized.

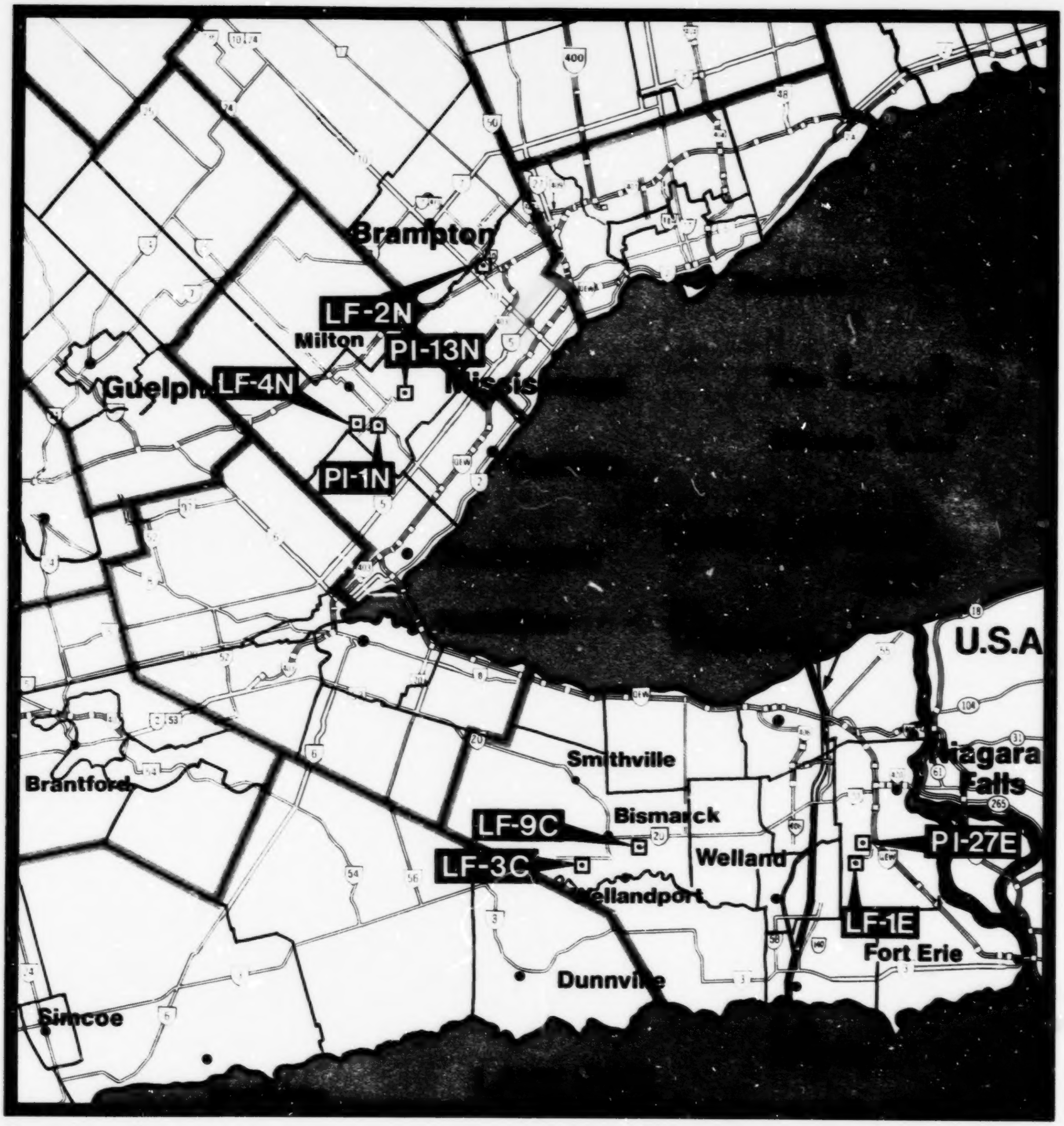
Generally, it is not expected that more than 110 hectares (275 acres) will be required for a landfill or a fully integrated site including a buffer zone. A physical/chemical treatment plant/incinerator site generally will require no more than 80 hectares (200 acres). Only 10 hectares (25 acres) are required for the plant site itself. The balance is the technical buffer area. The possible use and potential disposition of the buffer

## TABLE 6.1

## Facility Arrangements - Candidate Sites

| SITE | FACILITY ARRANGEMENTS | RATIONALE |
|---|---|---|
| Integrated/Landfill Sites | | |
| LF-2N - City of Mississauga | landfill only or landfill and physical/chemical treatment plant | incinerator not possible because of proximity to Pearson International Airport; stack would interfere with airport operations |
| LF-4N - Town of Milton | landfill only or landfill and physical/chemical treatment plant | incinerator not possible because of proximity to Niagara Escarpment |
| LF-3C - Township of West Lincoln | fully integrated or landfill only | |
| LF-9C - Township of West Lincoln | fully integrated or landfill only | |
| LF-1E - City of Niagara Falls | fully integrated or landfill only | landfill only may be preferred because of agricultural character of area and proximity of industrial site (PI-27E) |
| Physical/Chemical Treatment Plant-Incinerator | | |
| PI-13N - Town of Milton | incinerator or physical/ chemical treatment plant or both | in association with LF-2N or LF-4N |
| PI-1N - Town of Milton | incinerator or physical/ chemical treatment plant or both | in association with LF-2N or LF-4N |
| PI-27E - City of Niagara Falls | incinerator or physical/ chemical treatment plant or both | in association with LF-1E |

Figure 17. Candidate Sites—Location


Brampton
LF-2N
Milton
PI-13N
Missis
Guelph
LF-4N
PI-1N
400
U.S.A
Smithville
Niagara Falls
Bismarck
LF-9C
LF-3C
Welland
PI-27E
Wellandport
LF-1E
Fort Erie
Dunnville
Brantford
Simcoe

## Legend

⊡ Candidate Site

▬ Regional Municipal & County Boundaries

— Township, Town & City Boundaries

**LF** Landfill

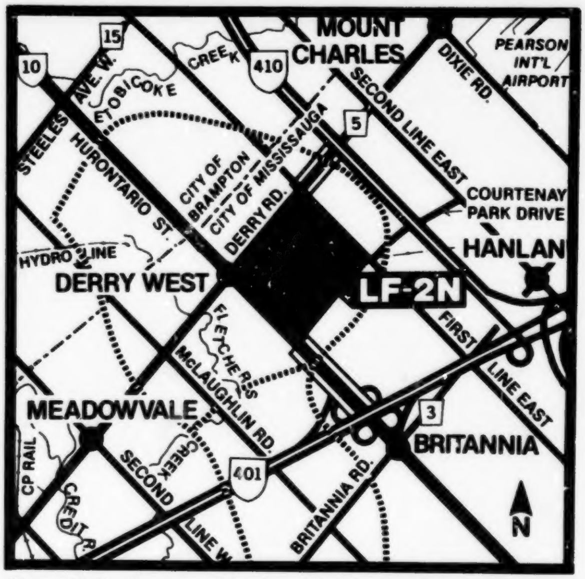
**PI** Physical/Chemical Treatment Plant & Incineration

Source: Ontario Waste Management Corporation. March, 1984.
Note: Symbols indicate location only, and not size or shape of sites.

| Site Name | Landfill | Physical/ Chemical | Incinerator | |
|---|---|---|---|---|
| LF-2N | • | • | | |
| LF-4N | • | • | | |
| PI-1N | | • | • | |
| PI-13N | | • | • | |
| LF-3C | • | • | • | Integrated |
| LF-9C | • | • | • | Integrated |
| LF-IE | • | • | • | Integrated |
| PI-27E | | • | • | |

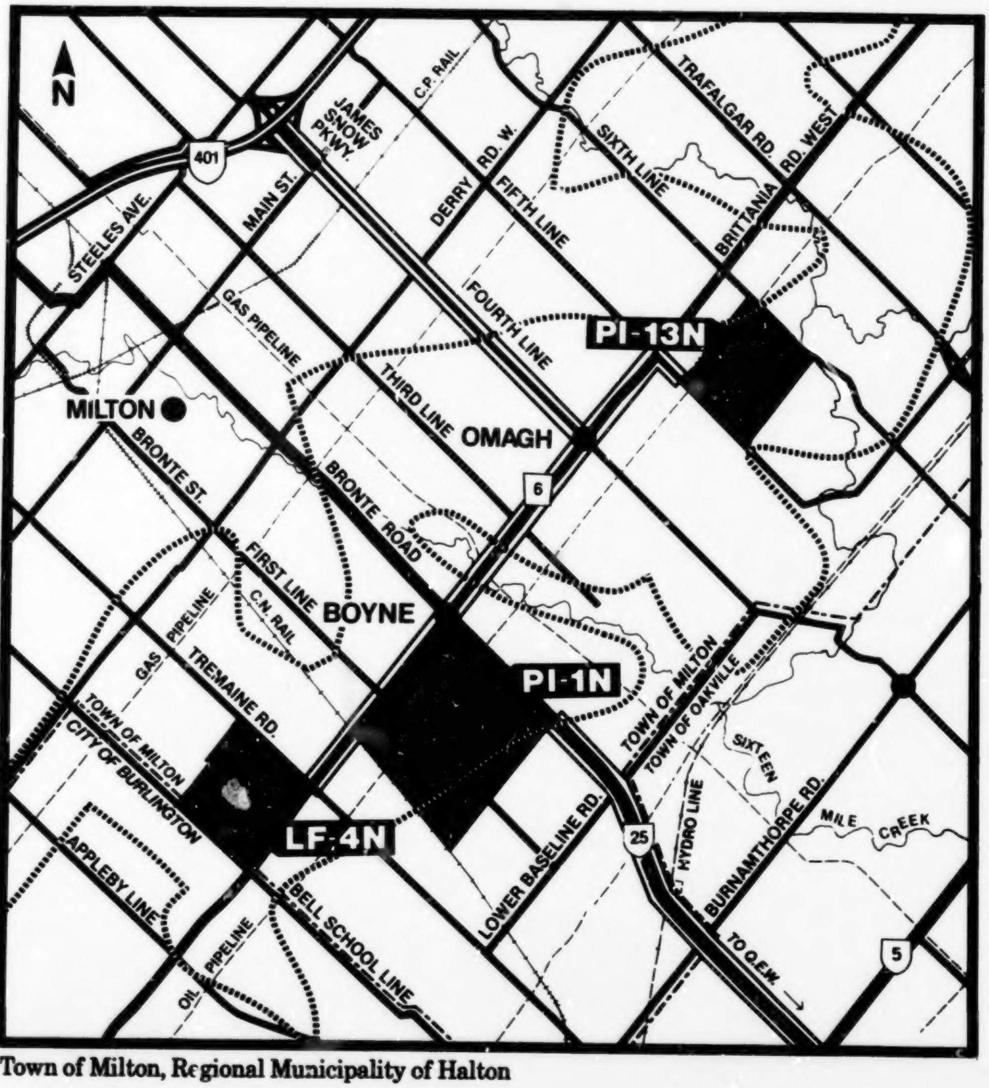
## Candidate Sites — Local Detail

Map A


MOUNT CHARLES
PEARSON INT'L AIRPORT
DIXIE RD.
15
10
410
ETOBICOKE CREEK
STEELES AVE. W.
HURONTARIO ST.
CITY OF BRAMPTON
CITY OF MISSISSAUGA
DERRY RD.
5
SECOND LINE EAST
COURTENAY PARK DRIVE
HANLAN
HYDRO LINE
DERRY WEST
LF-2N
FLETCHERS CREEK
McLAUGHLIN RD.
FIRST LINE EAST
MEADOWVALE
3
BRITANNIA
CP RAIL
CREDIT R.
SECOND LINE W.
401
BRITANNIA RD.
N

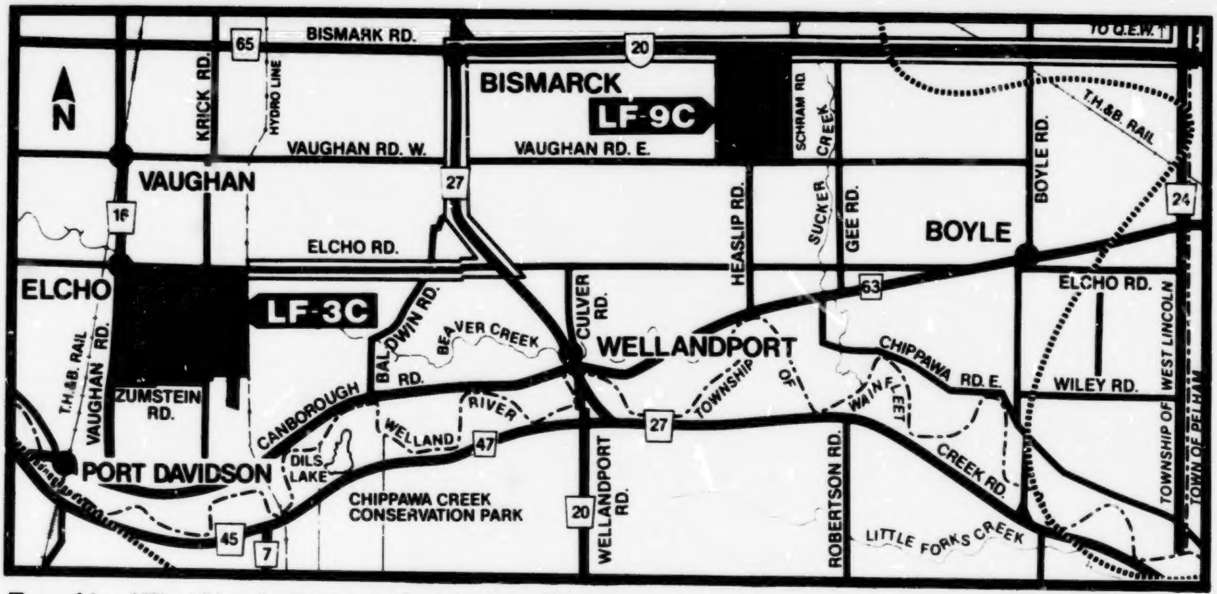
City of Mississauga, Regional Municipality of Peel

Map B

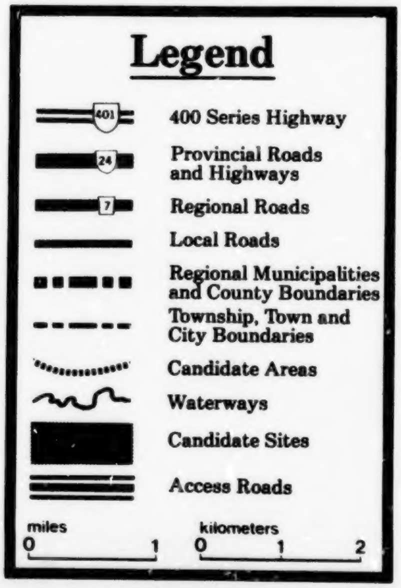

N
401
STEELES AVE.
MAIN ST.
JAMES SNOW PKWY.
C.P. RAIL
DERRY RD. W.
FIFTH LINE
SIXTH LINE
TRAFALGAR RD
BRITTANIA RD. WEST
GAS PIPELINE
FOURTH LINE
PI-13N
MILTON
BRONTE ST.
THIRD LINE
OMAGH
BRONTE ROAD
6
FIRST LINE
C.N. RAIL
BOYNE
GAS PIPELINE
TREMAINE RD.
PI-1N
TOWN OF MILTON
TOWN OF OAKVILLE
SIXTEEN MILE CREEK
HYDRO LINE
TOWN OF MILTON
CITY OF BURLINGTON
LF-4N
LOWER BASELINE RD.
25
BURNAMTHORPE RD.
APPLEBY LINE
BELL SCHOOL LINE
OIL PIPELINE
TO Q.E.W.
5

Town of Milton, Regional Municipality of Halton

Map C

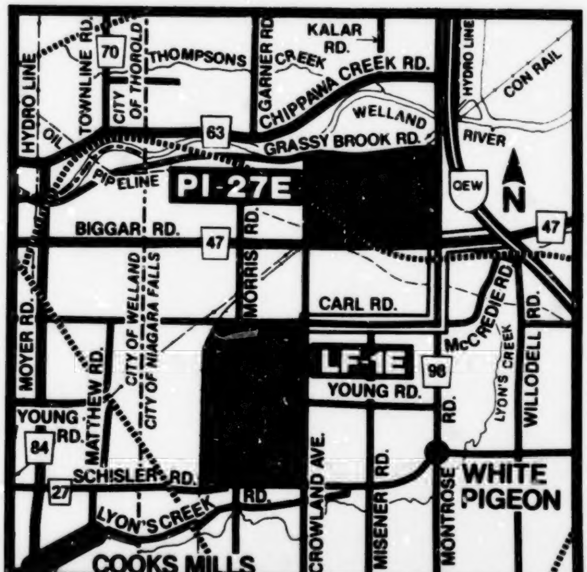

BISMARK RD.
65
20
TO Q.E.W.
BISMARCK
LF-9C
N
KRICK RD.
HYDRO LINE
SCHRAM RD.
CREEK
VAUGHAN RD. W.
VAUGHAN RD. E.
T.H.&B. RAIL
VAUGHAN
27
16
HEASLIP RD.
SUCKER
GEE RD.
BOYLE RD.
24
ELCHO RD.
BOYLE
ELCHO
LF-3C
BALDWIN RD.
BEAVER CREEK
CULVER RD.
63
ELCHO RD.
WELLANDPORT
T.H.&B. RAIL
VAUGHAN RD.
ZUMSTEIN RD.
CANBOROUGH
RD.
RIVER
TOWNSHIP
OF
CHIPPAWA
RD. E.
WILEY RD.
WAINFLEET
TOWNSHIP OF WEST LINCOLN
TOWN OF PELHAM
WELLAND
47
27
PORT DAVIDSON
DILS LAKE
WELLANDPORT RD.
ROBERTSON RD.
CREEK RD.
CHIPPAWA CREEK CONSERVATION PARK
20
45
7
LITTLE FORKS CREEK

Township of West Lincoln, Regional Municipality of Niagara


Legend
401
400 Series Highway
24
Provincial Roads and Highways
7
Regional Roads
Local Roads
Regional Municipalities and County Boundaries
Township, Town and City Boundaries
Candidate Areas
Waterways
Candidate Sites
Access Roads
miles
0
1
kilometers
0
1
2

Source: Ontario Waste Management Corporation, March, 1984.

Map D


TOWNLINE RD.
70
CITY OF THOROLD
THOMPSONS
GARNER RD.
KALAR RD.
CREEK
CHIPPAWA CREEK RD.
HYDRO LINE
CON RAIL
HYDRO LINE
OIL
63
WELLAND
GRASSY BROOK RD.
RIVER
PIPELINE
PI-27E
QEW
N
BIGGAR RD.
47
MORRIS RD.
47
CITY OF WELLAND
CITY OF NIAGARA FALLS
CARL RD.
MOYER RD.
MATTHEW RD.
LF-1E
McCREDIE RD.
LYON'S CREEK
WILLODELL RD.
98
YOUNG RD.
YOUNG RD.
84
SCHISLER RD.
RD.
27
CROWLAND AVE.
MISENER RD.
MONTROSE RD.
WHITE PIGEON
LYON'S CREEK
COOKS MILLS

City of Niagara Falls, Regional Municipality of Niagara

The maps accompanying the site descriptions in this chapter also include preliminary identification of the major access routes to the site. In some cases local access roads may need to be improved and upgraded. Alternative access routes were identified and compared. When a preferable route is not clearly evident, alternative access routes are shown on the maps. These alternative access routes will be considered in greater detail in Phase 4.

The reasons which led to the retention of each candidate site are highlighted below. Table 6.2 specifies the location, land requirements, access roads and facility components associated with each site. Table 6.3 presents a preliminary list of considerations and potential constraints associated with each site which must be addressed in Phase 4. It is recognized that additional considerations and concerns are likely to be identified as a result of further discussions with public agencies, municipalities and local residents.

**TABLE 6.2**

**Candidate Sites - General Characteristics**

| Site | Location | Land Requirements* | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinerator Alone | |
| LF-2N | City of Mississauga Regional Municipality of Peel | • 172 hectares (425 acres)<br>• north boundary - Derry Road West (Regional Rd. 5)<br>• east boundary - First Line East (local road)<br>• south boundary - ownership limits<br>• west boundary - Hurontario St. (Highway 10)<br>• land requirement based on land ownership limits | | 0 | | 0 | | • from 401 north on Hurontario Street (Highway 10) to site<br>• from PI1N, east on Britannia Road (Halton Regional Rd. 6) to Fourth Line, north on Fourth Line to James Snow Parkway, north on James Snow Parkway to 401, from 401 north on Hurontario Street (Highway 10) to site<br>• from PI13N - north on Fifth Line to Britannia Road West (Regional Road 6) west on Britannia Road West (Regional Road 6) to Fourth Line, north on Fourth Line, becomes James Snow Parkway at Main Street, to 401 from 401 north on Hurontario Street, Highway 10 to site |

*All sites are approximate

## TABLE 6.2

## Candidate Sites - General Characteristics

| Site | Location | Land Requirements | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinerator Alone | |
| LF-4N | Town of Milton<br>Regional Municipality of Halton | •168 hectares (415 acres)<br>• northeast boundary - Tremaine Road West (Regional Rd. 22)<br>• southeast boundary - Britannia Road West (Regional Rd. 6)<br>• southwest boundary - Bell School Road (local road)<br>• northwest site boundary - land ownership limits<br>• land requirements based on land ownership limits | | 0 | | 0 | | from 401 - south on the James Snow Parkway (ends at Main Street, becomes Fourth Line), south on Fourth Line to Britannia Road West (Regional Road 6) west on Britannia Road (Regional Road 6) to site<br>• from QEW - north on Bronte Rd. (Hwy. 25) to Britannia Road West (Regional Road 6) west on Britannia Road West to site<br>• from P11N - west on Britannia Road West (Regional Road 6)<br>• from P113N - north on Fifth Line to Britannia Road West (Regional Road 6), west on Britannia Road West to site |

### TABLE 6.2

### Candidate Sites - General Characteristics

| Site | Location | Land Requirements | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinerator Alone | |
| LF-3C | Township of West Lincoln Regional Municipality of Niagara | • 259 hectares (640 acres)<br>• south boundary - property ownership limits<br>• west boundary - Vaughan Road (Regional Rd. 10)<br>• north boundary - Elcho Road West<br>• east boundary - property ownership limits<br>• land requirements based on land ownership and need for further investigations | 0 | 0 | | | | • from QEW south on Regional Rd. 24 (Victoria Avenue/ Townline Road) to Highway 20, west on Highway 20 to Wellandport Road (Regional Rd. 27), south on Regional Rd. 27 to Elcho Road West, west on Elcho Road West |
| LF-9C | Township of West Lincoln Regional Municipality of Niagara | • 135 hectares (335 acres)<br>• north boundary - Highway 20 (Bismarck Rd.)<br>• east boundary - Schram Road (local road)<br>• south boundary - Vaughan Road E. (local road)<br>• west boundary - land ownership limits<br>• land requirements based on land ownership boundaries | 0 | 0 | | | | • from QEW - south on Regional Road 24 (Victoria Avenue/ Townline Road) to Highway 20, west on Highway 20 to site |

## TABLE 6.2

**Candidate Sites - General Characteristics**

| Site | Location | Land Requirements | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinarator Alone | |
| LF-1E | City of Niagara Falls Regional Municipality of Niagara | • 273 hectares (675 acres)<br>• north boundary - Carl Road (local road)<br>• east boundary - Crowland Avenue (local road)<br>• south boundary - Schisler Road (Regional Rd. 27)<br>• west boundary - ConRail line<br>• land requirements based on land ownership and need for further investigations | 0 | 0 | | 0 | | • from QEW - west on Regional Road 47 (Biggar Road/Lyons Creek Road) to Regional Road 98 (Montrose Road), south on Regional Road 98 (Montrose Road) to Carl Road and west on Carl Road to LF1E<br>• to P127E - east on Carl Road to Regional Road 97 and Montrose Road, north on Regional Road 98 to Montrose Road to Regional Road 47 (Bigger Road) west on Regional Road 47 (Bigger Road) to site; possibility-new road - parallel to ConRail line |

## TABLE 6.2

## Candidate Sites - General Characteristics

| Site | Location | Land Requirements | Facility Arrangement Options |  |  |  |  | Access Roads |
|---|---|---|---|---|---|---|---|---|
|  |  |  | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinerator Alone |  |
| PI-IN | Town of Milton<br>Regional Municipality of Halton | • 378 hectares (935 acres)<br>• northeast boundary - Bronte Road (Highway 25)<br>• northwest boundary - Britannia Road West (Regional Road 6)<br>• southwest boundary - CN Rail line<br>• Southeast boundary - land ownership limits<br>• land requirements based on land ownership limits and need for more detailed site investigations |  |  | 0 |  | 0 | • from 401 - south on James Snow Parkway (ends at Main Street, becomes Fourth Line) south on Fourth Line to Britannia Road West (Regional Rd. 6) west on Britannia Road West to site<br>• from QEW - north on Hwy. 25 to Britannia Road West (Regional Rd. 6) west on Britannia Road West (Regional Rd. 6) to site<br>• to LF4N, west on Britannia Road West (Regional Rd. 6) to site<br>• to LF2N - east on Britannia Road West (Regional Road 6) to Fourth Line, north on Fourth Line (becomes James Snow Parkway at Main Street) to 401, from 401 north on Hurontario Street (Highway 10) to site |

## TABLE 6.2

## Candidate Sites - General Characteristics

| Site | Location | Land Requirements | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill& Phys/Ch. | Incinerator Alone | |
| PI-13N | Town of Milton<br>Regional Municipality of Halton | • 170 hectares (420 acres)<br>• north boundary - ownership boundaries<br>• east boundary - Sixth Line<br>• south boundary - ownership boundaries<br>• west boundary - Fifth Line<br>• larger than required - land ownership | | | 0 | | 0 | • from 401 - south on James Snow Parkway (ends at Main Street becomes Fourth Line, south on Fourth Line to Britannia Road West (Regional Road 6), east on Britannia Road West to Fifth Line, south on Fifth Line to site.<br>• from QEW - north on Highway 25 to Britannia Road West, east on Britannia Road West to Fifth Line, south on Fifth Line to site<br>• to LF4N - north on Fifth Line to Britannia Road West, (Regional Rad 6), west on Brittania Road West (Regional Road 6) to site |

## TABLE 6.2

## Candidate Sites - General Characteristics

| Site | Location | Land Requirements | Facility Arrangement Options | | | | | Access Roads |
|---|---|---|---|---|---|---|---|---|
| | | | Integrated | Landfill Only | Phys/Ch. & Incin. | Landfill & Phys/Ch. | Incinerator Alone | |
| PII-13N | Town of Milton<br>Regional Municipality of Niagara | (see above) | | | 0 | | 0 | • to LF2N - north on Fifth Line to Britannia Road West (Regional Road 6), west on Britannia Road West (Regional Road 6) to Fourth Line, north on Fourth Line, becomes James Snow Parkway at Main Street, to 401, from 401 north on Hurontario Street (Highway 10) to site |
| PI-27E | City of Niagara Falls<br>Regional Municipality of Niagara | • 188 hectares (465 acres)<br>• north boundary - Grassy Brook Road (local road)<br>• east boundary - Montrose Road (Regional Rd. 98)<br>• south boundary - Biggar Road (Regional Rd. 47)<br>• west boundary - Morris Road (local road) | | | 0 | | 0 | • from QEW - west on Regional Road 47 (Biggar Road/Lyons Creek Road) to PI27E<br>• to LF1E - east on Regional Road 47 (Biggar Road) to Regional Road 98 (Montrose Road), south on Regional Road 98 (Montrose Road) to Carl Road west on Carl Road to LF1E; possibility of new road parallel to ConRail line |

## TABLE 6.3

## Candidate Sites - Particular Considerations for Phase 4 Analysis

| Site | Physical and Biological | | | | | | | | | | Social and Land Use | | | | | | | | | Transportation and Utilities | | | | | Financial | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | |
| LF-2N<br>(City of Mississauga) | 0 | | 0 | 0 | | | | | | | 0 | 0 | 0 | 0 | | | | 0 | 0 | | | | | 0 | 0 | | ° Impact on operations of transmission lines<br>° Impact on industrial uses in site vicinity |
| LF-4N<br>(Town of Milton) | 0 | | 0 | 0 | | | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | | | | | | ° views from/to Niagara Escarpment<br>° operations - Burlington Airpark<br>° century farm on-site |
| PI-1N<br>(Town of Milton) | 0 | | 0 | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | | | | | ° air dispersion constraint - Niagara Escarpment<br>° operations - Burlington Airpark |
| PI-13N<br>(Town of Milton) | 0 | | 0 | 0 | 0 | | | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 0 | | | | ° Impact on industrial areas on-site and in site vicinity |
| LF-3C<br>(Township of West Lincoln) | 0 | 0 | 0 | 0 | | | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | | | 0 | ° proximity to Beaver Creek and Welland River<br>° proximity to church and conservation area |
| LF-9C<br>(Township of West Lincoln) | 0 | 0 | 0 | | | | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 | 0 | | 0 | |
| LF-1E<br>(City of Niagara Falls) | 0 | 0 | | | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | | 0 | | 0 | 0 | | | 0 | |
| PI-27E<br>(City of Niagara Falls) | 0 | 0 | 0 | 0 | 0 | | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 | 0 | | | | 0 | | | 0 | ° proximity to Grassy Brook<br>° potential impacts - ConRail operations |

See Page 2 for Legend
0 - Indicates that consideration identified in legend has a particular application to this site

## TABLE 6.3

## Candidate Sites - Particular Considerations for Phase 4 Analysis

LEGEND:

Physical and Biological:

1. hydrogeological suitability
2. oil and gas wells in area
3. drainage courses on-site
4. proximity to flood plains
5. proximity to populated areas
6. constraints to air dispersion
7. existing air quality
8. stream crossings and hydrogeologically sensitive lands on access routes
9. significant environmental units
10. wooded areas on-site

Social:

1. displacement of houses and other uses
2. site vicinity - noise, visual intrusion
3. access roads - noise, visual intrusion
4. risks to residents
5. risk to crops and livestock
6. impacts on farm operations
7. impacts on stability of agricultural community
8. future land use changes
9. archaeological potential

Transportation and Utilities

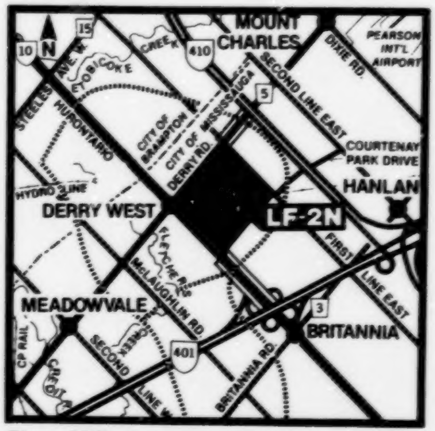
1. potential interference with local traffic
2. potential impacts - local airport operations
3. road closings
4. risks, impacts and costs - haulage to site
5. impacts and costs - utility relocations and operations

Financial

1. land acquisition
2. transportation

## DESCRIPTION OF CANDIDATE SITES

Map A

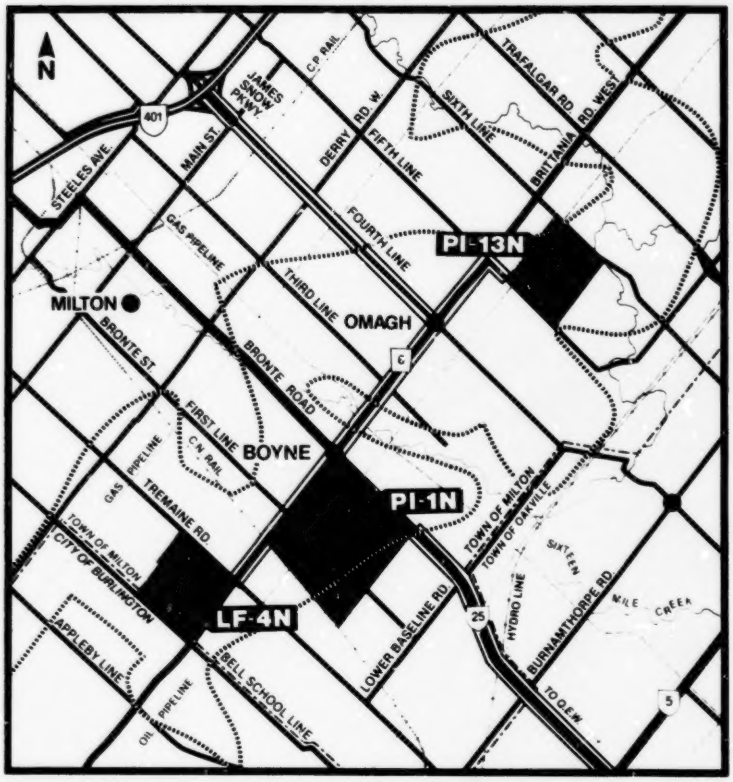

N
10
15
STEELES AVE. W.
ETOBICOKE CREEK
410
MOUNT CHARLES
DIXIE RD.
PEARSON INT'L AIRPORT
SECOND LINE EAST
5
CITY OF BRAMPTON
CITY OF MISSISSAUGA
DERRY RD.
HURONTARIO
COURTENAY PARK DRIVE
HANLAN
HYDRO LINE
DERRY WEST
LF-2N
FLETCHER CREEK
FIRST LINE EAST
McLAUGHLIN RD.
MEADOWVALE
3
BRITANNIA
CP RAIL
CREDIT
SECOND LINE W
401
BRITANNIA RD.

City of Mississauga,
Regional Municipality of Peel

### City of Mississauga - Candidate Site LF-2N

Site LF-2N is suitable only for a landfill or a landfill in combination with a physical/chemical treatment plant. An incinerator is not possible at the site because the stack would interfere with the operations of Pearson International Airport. The major advantages associated with LF-2N include its proposed industrial designation, its good regional access and its proximity to other possible facility components in the Town of Milton. In addition, the site has no major constraint on or off-site which would be sufficient to reject the site at this stage, although its land costs are estimated to be high.

Map B


N
401
STEELES AVE.
MAIN ST.
JAMES SNOW PKWY.
C.P. RAIL
DERRY RD. W.
FIFTH LINE
SIXTH LINE
TRAFALGAR RD
BRITTANIA RD. WEST
FOURTH LINE
PI-13N
GAS PIPELINE
THIRD LINE
OMAGH
MILTON
BRONTE ST.
BRONTE ROAD
FIRST LINE
C.N. RAIL
BOYNE
GAS PIPELINE
TREMAINE RD
PI-1N
TOWN OF MILTON
CITY OF BURLINGTON
LF-4N
APPLEBY LINE
OIL PIPELINE
BELL SCHOOL LINE
LOWER BASELINE RD
25
TOWN OF MILTON
TOWN OF OAKVILLE
HYDRO LINE
SIXTEEN MILE CREEK
BURNAMTHORPE RD
TO Q.E.W.
5

Town of Milton, Regional Municipality of Halton

## Town of Milton - Candidate Site LF-4N

Site LF-4N has a number of attributes which make it potentially suitable as a partially integrated facility (i.e. a landfill only or a landfill and a physical/chemical treatment plant). It has good regional access, appears to be a good site hydrogeologically, has moderate land acquisition and transportation costs, and appears to have relatively moderate constraints on the site, in the site vicinity and along the access roads to the site. The potential constraints which have been identified to date either require further investigation or are not sufficiently severe (either absolutely or relative to other candidate sites) to warrant rejection at this stage. This investigation will also involve close liaison with Region of Halton officials, who currently are examining possible sites for a regional landfill.

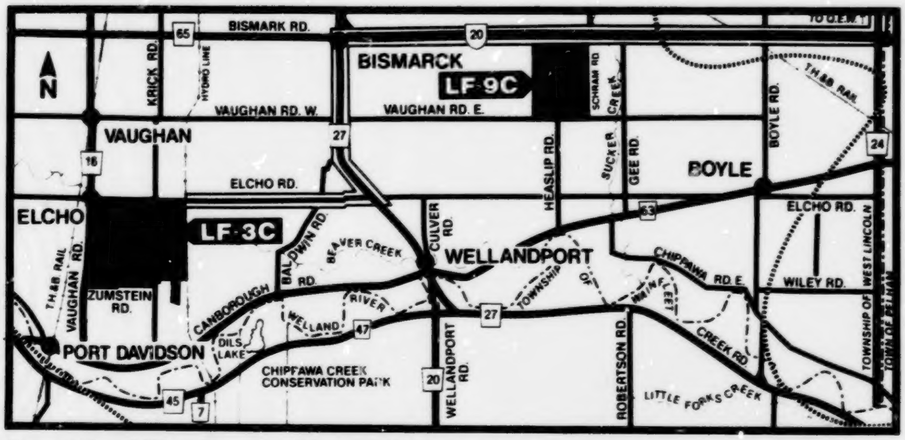
Town of Milton - Candidate Site PI-1N (see Map B, page 82)

Site PI-1N shares many of the advantages associated with LF-4N including good regional access, hydrogeological suitability (for an incinerator and/or physical/chemical treatment plant only, because of the limited depth of clay), moderate land costs and no very severe constraints on or off-site. In addition, it is located in an urban shadow area and is further removed from the Niagara Escarpment than LF-4N (approximately 2 km between locations), so that the escarpment would represent less of a constraint to air dispersion. It is sufficiently close to LF-4N that the transportation costs and impacts associated with a LF-4N/PI-1N partially integrated option would be relatively minor.

Town of Milton - Candidate Site PI-13N (see Map B, page 82)

The advantages associated with PI-13N (a physical/chemical treatment plant and/or an incinerator) include good regional access, predominantly publicly-owned land, relatively limited air dispersion constraints (the site is further removed from the Niagara Escarpment and Milton than is PI-1N) and proximity to both LF-4N and LF-2N.

Map C


BISMARK RD.
BISMARCK
LF-9C
VAUGHAN RD. W.
VAUGHAN RD. E.
VAUGHAN
ELCHO RD.
ELCHO
LF-3C
BOYLE
WELLANDPORT
PORT DAVIDSON
ZUMSTEIN RD.
CANBOROUGH RD
BEAVER CREEK
WELLAND RIVER
CHIPPAWA CREEK CONSERVATION PARK
DILS LAKE
CHIPPAWA CREEK RD
LITTLE FORKS CREEK
KRICK RD.
HEASLIP RD.
GEE RD.
BOYLE RD.
ROBERTSON RD.
WELLANDPORT RD.
CULVER RD
BALDWIN RD
WILEY RD.
TOWNSHIP OF WEST LINCOLN
TOWN OF PELHAM
N

Township of West Lincoln, Regional Municipality of Niagara

## Township of West Lincoln - Candidate Site LF-3C

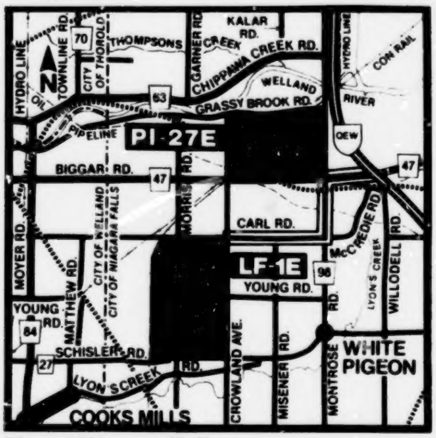
The major advantages associated with LF-3C (a fully integrated facility or landfill only) are its potentially very deep and consistent clay soils, the absence of air quality constraints and moderate land costs. Based on a regional analysis, LF-3C (and LF-9C) offer the deepest and most consistent clay soils of all the candidate sites. LF-3C has the additional advantage that the underlying aquifer is of relatively poor quality for human use. Although located in a stable agricultural area, LF-3C is located on predominantly classes 3 and 4 agricultural land and would have relatively moderate on-site agricultural impacts.

## Township of West Lincoln - Candidate Site LF-9C (see Map C, page 84)

LF-9C (a fully integrated facility or landfill only) also is located in potentially very deep and consistent clay soils, has no air dispersion constraints and moderate land costs. LF-9C also is located on classes 3 and 4 agricultural lands. The site has more direct access than LF-3C, but would have somewhat greater on-site agricultural impacts and may be located over a regionally significant aquifer buried more than 30 m below the deep clays.

Sites LF-3C and LF-9C are relatively less desirable candidate sites because of difficult transportation access and the rural/agricultural nature of the communities in which they are located. Nevertheless, they have been retained for the next stage of analysis because they are located over especially deep and consistent clay soils.

Map D


N
HYDRO LINE
TOWNLINE RD.
70
CITY OF THOROLD
THOMPSONS
KALAR RD.
GARNER RD.
CREEK
CHIPPAWA CREEK RD.
HYDRO LINE
CON RAIL
WELLAND
RIVER
GRASSY BROOK RD.
63
OIL PIPELINE
PI-27E
QEW
47
BIGGAR RD.
47
CITY OF WELLAND
CITY OF NIAGARA FALLS
MORRIS RD.
CARL RD.
MOYER RD.
MATTHEW RD.
LF-1E
98
McCREDIE RD.
LYON'S CREEK
WILLODELL RD.
YOUNG RD.
YOUNG RD.
84
SCHISLER RD.
27
LYON'S CREEK
RD.
CROWLAND AVE.
MISENER RD.
MONTROSE RD.
WHITE PIGEON
COOKS MILLS

City of Niagara Falls,
Regional Municipality of Niagara

## City of Niagara Falls - Candidate Site LF-1E

LF-1E has several attributes which make it potentially suitable for either a landfill or a fully integrated facility. It is near the QEW and site PI-27E. It is also located in an urban shadow area, near existing and planned industrial areas and appears to be hydrogeologically suitable.

## City of Niagara Falls - Candidate Site PI-27E

The three major advantages associated with PI-27E (a physical/chemical treatment plant and/or an incinerator) are its immediate access to the QEW, its proposed industrial designation and its close proximity to LF-1E. The on and off-site constraints associated with PI-27E also appear to be relatively moderate.

## Concluding Comments

All of the sites described above have major advantages and all have some disadvantages. These advantages and disadvantages vary from site to site and in Phase 4, the trade-offs among siting options will be explored. As indicated in Table 6.3, there are a number of potential constraints associated with each site which must be considered in greater detail. It is also recognized that more detailed field investigations, as well as discussions with provincial and municipal agencies and local residents, may identify additional constraints. In Chapter 7, the major considerations to be included in the Phase 4 analyses are outlined.

# 7. Looking Ahead

## SITE SELECTION

Chapter 4 describes the two future steps in OWMC's site selection process: Identifying the preferred site or sites from among the canadidate sites announced in this report, and the final detailed testing of the preferred site or sites. This section presents some details on these next two steps.

### Selection of Preferred Site or Sites

The identification of candidate sites was achieved through the analysis of reports, records, data and plans which yielded information on the site, in the site vicinity and along access routes. Numerous meetings with federal and provincial agencies, municipal officials, conservation authorities, educational and research institutions and individuals were conducted to collect and confirm these data. In addition, some general field work supplemented and verified data collected for each site.

The first stage of Phase 4 will involve the collection of further, more detailed information about the candidate sites. To some extent these activities will vary depending on the site under consideration and the concerns and considerations raised by individuals, agencies and municipalities. The data gathering activities for each site are outlined in Table 7.1.

The further information required also will be obtained from a number of sources, including federal, provincial and municipal government agencies, and secondary information sources such as reports and recorded data. Meetings with municipalities, private agencies, private landowners, industries, interest groups and individuals will be conducted in order to obtain the most extensive and accurate information available.

## TABLE 7.1 - Preliminary Identification of Phase 4 Activities

| FACTOR | DETAILED COMPARATIVE EVALUATION |  |  | SITE TESTING AND MONITORING |  |  |
|---|---|---|---|---|---|---|
|  | Site | Site Vicinity | Access Roads/ Utility Easements | Site | Site Vicinity | Access Roads/ Utility Easements |
| Biological (hydrogeology, hydrology, air dispersion, biology) | • conduct analysis of water wells, preliminary geological bore holes, groundwater use, oil and gas well data<br>• undertake preliminary ground water flow and exposure analysis<br>• conduct preliminary flooding and drainage analysis<br>• determine preliminary water quality characteristics | • conduct analysis of water wells, geological bore holes, groundwater use, oil and gas well data<br>• conduct preliminary groundwater flow and exposure analysis<br>• conduct preliminary flooding and drainage analysis<br>• conduct preliminary water quality analysis<br>• conduct air emission, dispersion & exposure analysis<br>• conduct analysis of air quality and sensitive receptors – human, livestock, crops, vegetation, wildlife | • conduct overview of sensitive groundwater conditions<br>• conduct analysis of major surface water pathways, e.g. water quality, flood susceptibility<br>• undertake analysis of major constraints to air dispersion | • undertake on-site drilling, sampling and testing<br>• conduct comprehensive groundwater flow analysis<br>• undertake on-site surface water analysis and develop surface drainage design guidelines<br>• undertake monitoring of air quality and meteorological conditions<br>• develop hydrogeological design guidelines<br>• develop hydrogeological monitoring guidelines | • develop comprehensive groundwater monitoring program<br>• conduct surface water testing and monitoring<br>• monitor air quality and meteorological conditions<br>• develop flood protection plan if required | • conduct analysis of sensitive groundwater conditions<br>• conduct analysis of major surface water pathways<br>• conduct analysis of noise and dust emissions and methods of mitigation and monitoring |
|  | • prepare preliminary vegetation inventory<br>• conduct preliminary analysis of vegetation species and wildlife<br>• determine quality of fish and aquatic habitats<br>• interpret significance | • prepare preliminary vegetation inventory<br>• conduct preliminary analysis of vegetation species and wildlife<br>• determine quality of fish and aquatic habitats<br>• interpret significance | • analyze sensitive receptors, e.g. aquatic habitat<br>• analyze biological impacts of road improvements and utility re-routings<br>• inventory sensitive biological uses downstream of stream crossings | • undertake inventory and monitoring – plant species and wildlife habitat | • undertake inventory and monitoring – plant and animal species, fish and aquatic habitat | • conduct analysis of sensitive receptors<br>• address biological impacts and methods of mitigation and monitoring |

TABLE 7.1 - Preliminary Identification of Phase 4 Activities

| FACTOR | DETAILED COMPARATIVE EVALUATION | | | SITE TESTING AND MONITORING | | |
|---|---|---|---|---|---|---|
| | Site | Site Vicinity | Access Roads/ Utility Easements | Site | Site Vicinity | Access Roads/ Utility Easements |
| Social (land use, economic, social, agriculture) | • conduct analysis of existing planned and proposed land uses<br>• conduct analysis of public and private economic impacts<br>• undertake archaeological surveys<br>• undertake analysis of historical buildings and resources<br>• undertake analysis of community facility impacts<br>• undertake analysis - land tenure, acreage, estimated value of crops, sensitive crops, soil yield potential - field crops and specialty crops, livestock and poultry populations<br>• undertake analysis of characteristics of existing farm operations | • conduct analysis of existing planned and proposed land uses<br>• conduct analysis of land use compatibility<br>• conduct analysis of land ownership and land values, municipal services and finances<br>• conduct analysis of business impacts and benefits<br>• conduct analysis of community facility impacts<br>• conduct visual and noise impact analysis<br>• conduct analysis of local, community and regional impacts on community character, image and lifestyle | • conduct analysis - land use impacts - road improvements and truck traffic<br>• conduct analysis - economic impacts - road improvements and truck traffic<br>• conduct visual and noise impacts analysis<br>• conduct analysis - potential interference with pedestrian and vehicle movements - community facilities and uses<br>• determine impacts of road improvements and truck traffic on land loss, farm buildings, cattle access, machinery movement<br>• analyze transportation risk | • conduct analysis of lost potential - land use<br>• conduct analysis of economic impacts, mitigative measures and compensation<br>• conduct detailed archaeological surveys<br>• undertake detailed historical buildings and resource analysis<br>• conduct analysis of social impacts, mitigative measures and compensation<br>• conduct analysis of long term impacts and risks - agricultural capability, use and productivity for lands within the buffer | • conduct analysis of land use impacts, controls and monitoring measures<br>• undertake analysis of economic impacts, mitigative measures and compensation<br>• conduct visual impact analysis<br>• conduct community monitoring program<br>• conduct analysis of community and community facility impacts, mitigative measures and compensation<br>• conduct analysis of short and long term impacts - agricultural operations, character of agricultural community<br>• analysis of methods - mitigation, monitoring and compensation for adjacent farm operations<br>• collect baseline data on soil chemistry, crop yield levels and animal health performance status | • conduct analysis - land use impacts, mitigative measures and monitoring procedures<br>• conduct analysis - economic impacts, mitigative measures, compensation and monitoring procedures<br>• conduct analysis of social impacts, mitigative measures and compensation<br>• conduct analysis of agricultural impacts, mitigative measures and compensation |

TABLE 7.1 - Preliminary Identification of Phase 4 Activities

| FACTOR | DETAILED COMPARATIVE EVALUATION | | | SITE TESTING AND MONITORING | | |
|---|---|---|---|---|---|---|
| | Site | Site Vicinity | Access Roads/ Utility Easements | Site | Site Vicinity | Access Roads/ Utility Easements |
| | | • conduct analysis - land tenure, acreage, estimated value of crops, sensitive crops, soil yield potential, field crops and specialty crops, livestock and poultry populations<br>• analysis of characteristics of existing farm operations | | | | |
| Transportation and Utilities Transmission Line | • determine road closure requirements and impacts | • analyze receiver site access routes, within the site vicinity including structural condition and adequacy and effects on existing levels of service<br>• determine impacts associated with road realignments and utility realignment and extensions through site vicinity<br>• determine possibility of conflict with operations of local airports. | • determine access routes to sites<br>• determine utility realignment, relocation and extension requirements<br>• determine time and distance by road type<br>• determine time and distance for rail haulage (where practical) and probable routings<br>• determine number of waste transport vehicles required on a daily basis<br>• consider implications of grade rail crossings | - | • refine analysis of off-site road and utility impacts, mitigative measures and compensation<br>• determine transportation and utility capital and operating costs<br>• determine local transportation impact monitoring procedures | • refine regional analysis of access routes, impacts and methods of mitigation, compensation and monitoring |

TABLE 7.1 - Preliminary Identification of Phase 4 Activities

| FACTOR | DETAILED COMPARATIVE EVALUATION | | | SITE TESTING AND MONITORING | | |
|---|---|---|---|---|---|---|
| | Site | Site Vicinity | Access Roads/ Utility Easements | Site | Site Vicinity | Access Roads/ Utility Easements |
| Costs | • determine acquisition costs (including relocation and injurious affection)<br>• determine site improvement costs<br>• determine overall capital and operating costs | • prepare preliminary estimate of compensation costs | • determine road improvement and utility relocation and extension costs<br>• determine ongoing transportation costs (breakdown - shippers and OWMC costs) | • refine acquisition costs<br>• refine site improvement costs<br>• refine overall capital and operating costs including compensation, local benefits and monitoring | • refine road improvement and utility capital and operating costs<br>• refine transportation costs | • refine transportation costs including breakdown of shipper and OWMC costs |

This first stage will take several months to complete and will conclude with the selection of a preferred site or sites and the release of a Phase 4 Interim Report.

### Detailed Site Testing

The preferred site(s) will be examined in detail, including on-site drilling, surveys and testing (see Table 7.1 for details of the preferred site analysis).

A number of additional issues will be analyzed in Phase 4. Noise and dust emissions as a result of increased truck traffic along access routes, municipal services and finance, and the visual impact of an OWMC facility on the surrounding landscape, will receive detailed consideration. An analysis of possible risk to human health will include consideration of the calculated and perceived risks associated with the transport of special wastes to facility components as well as the short-term and long-term health implications, if any, to people, crops, livestock and sensitive biological resources. The affected municipalities, groups and individuals in the site vicinity and along the access roads will be involved in discussions concerning potential environmental impacts.

## OWMC AND THE COMMUNITY

OWMC recognizes that, regardless of where its facilities are located, and how well they are designed, some local residents and municipalities will react negatively to any plan to establish waste management facilities in their community. Many of their fears and concerns should be reduced or eliminated as OWMC describes details of its facility design and of the operating procedures planned. At the same time, communities will want to know more about OWMC's views of how a long-term relationship will be established between the Corporation and the communities in which it locates facilities. OWMC is now developing policy options to present for public discussion on the issues of compensation, community benefits and other questions associated with relations between the Corporation and the community. Meetings will then be held under OWMC's public consultation program at which private citizens and public officials can discuss these options.

## FACILITY DESIGN AND ENGINEERING

Some of the issues and alternatives associated with the planning of the facilities themselves are discussed in Chapter 3 of this report. In Phase 4 further investigation of these questions and others will develop more precise data on process and equipment alternatives. Some of the investigations to be emphasized in Phase 4 are the following:

- Waste quantities and facility capacity: Analysis of the results of continuing surveys of special waste generation in Ontario will refine the estimates of the types and quantities of waste to arrive at a design capacity for OWMC's facilities.

- Alternative treatment and disposal processes: Evaluation of different treatment and disposal processes will be pursued by acquiring further data on specific equipment. Combined with more precise waste characterization, this information will enable more detailed comparisons of alternative technologies.

- Potential emissions and impacts: From the foregoing studies, more detailed estimates on the type of emissions and other environmental impacts (such as transportation) will be made.

- Economic evaluation: More precise estimates of the cost of waste treatment technologies will also be developed, allowing a better understanding of the Corporation's potential market and its pricing alternatives.

- Design Engineering: Once the treatment and disposal alternatives at the specific process level are evaluated and favoured options are selected, guidelines for construction, operation, monitoring and occupational health and safety will be developed.

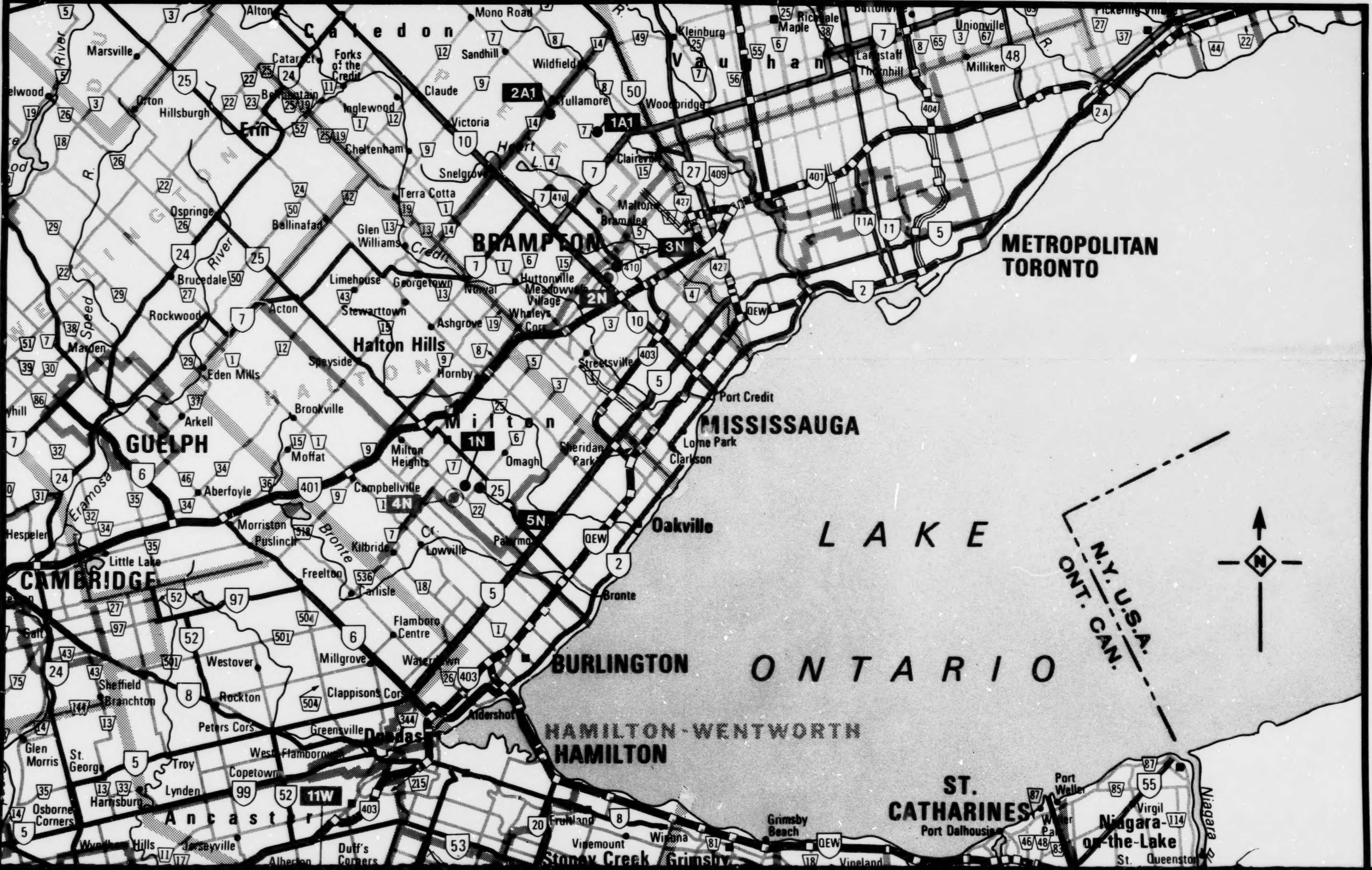
## Public Consultation

In Phase 4, the public consultation program will be designed to provide site area residents and municipal and regional officials with numerous opportunities to discuss the work of the Corporation. These activities will include:

- a series of information days in each candidate site community. Dates and locations will be announced as soon as possible in local and regional newspapers and on radio.
- contact with local groups, societies, clubs and organizations. Letters will be sent to these groups immediately following the release of this report.
- a series of workshops and seminars in the candidate site communities for interested participants to discuss Phase 4 issues in more detail. These will be similar in format to the seminars OWMC has held in candidate areas in the past several months.

In addition to these programs, OWMC will be available to meet with municipal and regional councils, planning officials and site area residents to discuss this report.

Figure 14. Site Areas—Engineered Landfill or Integrated Facility


2A1
1A1
3N
2N
1N
4N
5N
11W
Caledon
Vaughan
Halton Hills
Milton
BRAMPTON
GUELPH
CAMBRIDGE
METROPOLITAN TORONTO
MISSISSAUGA
Oakville
BURLINGTON
HAMILTON-WENTWORTH
HAMILTON
ST. CATHARINES
Niagara-on-the-Lake
LAKE ONTARIO
N.Y. U.S.A.
ONT. CAN.
N
Marsville
Alton
Mono Road
Sandhill
Wildfield
Kleinburg
Maple
Richvale
Unionville
Langstaff
Thornhill
Milliken
Pickering Village
Cataract
Forks of the Credit
Belfountain
Erin
Hillsburgh
Orton
Inglewood
Claude
Tullamore
Woodbridge
Victoria
Cheltenham
Snelgrove
Claireville
Terra Cotta
Malton
Bramalea
Ospringe
Ballinafad
Glen Williams
Credit
Limehouse
Georgetown
Norval
Huttonville
Meadowvale Village
Whaleys Cors
Brucedale
Rockwood
Acton
Stewarttown
Ashgrove
Marden
Speed
River
Eden Mills
Speyside
Hornby
Streetsville
Port Credit
Arkell
Brookville
Moffat
Milton Heights
Omagh
Sheridan Park
Lorne Park
Clarkson
Aberfoyle
Campbellville
Eramosa
Hespeler
Morriston
Puslinch
Bronte
Kilbride
Lowville
Palermo
Little Lake
Freelton
Carlisle
Flamboro Centre
Galt
Westover
Millgrove
Waterdown
Sheffield
Branchton
Rockton
Clappisons Cors
Aldershot
Peters Cors.
Greensville
Dundas
West Flamborough
Glen Morris
St. George
Troy
Copetown
Lynden
Harrisburg
Osborne Corners
Ancaster
Wyndham Hills
Jerseyville
Alberton
Duff's Corners
Fruitland
Vinemount
Winona
Stoney Creek
Grimsby
Grimsby Beach
Vineland
Port Weller
Port Dalhousie
Virgil
St.
Queenston
Niagara
401
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410
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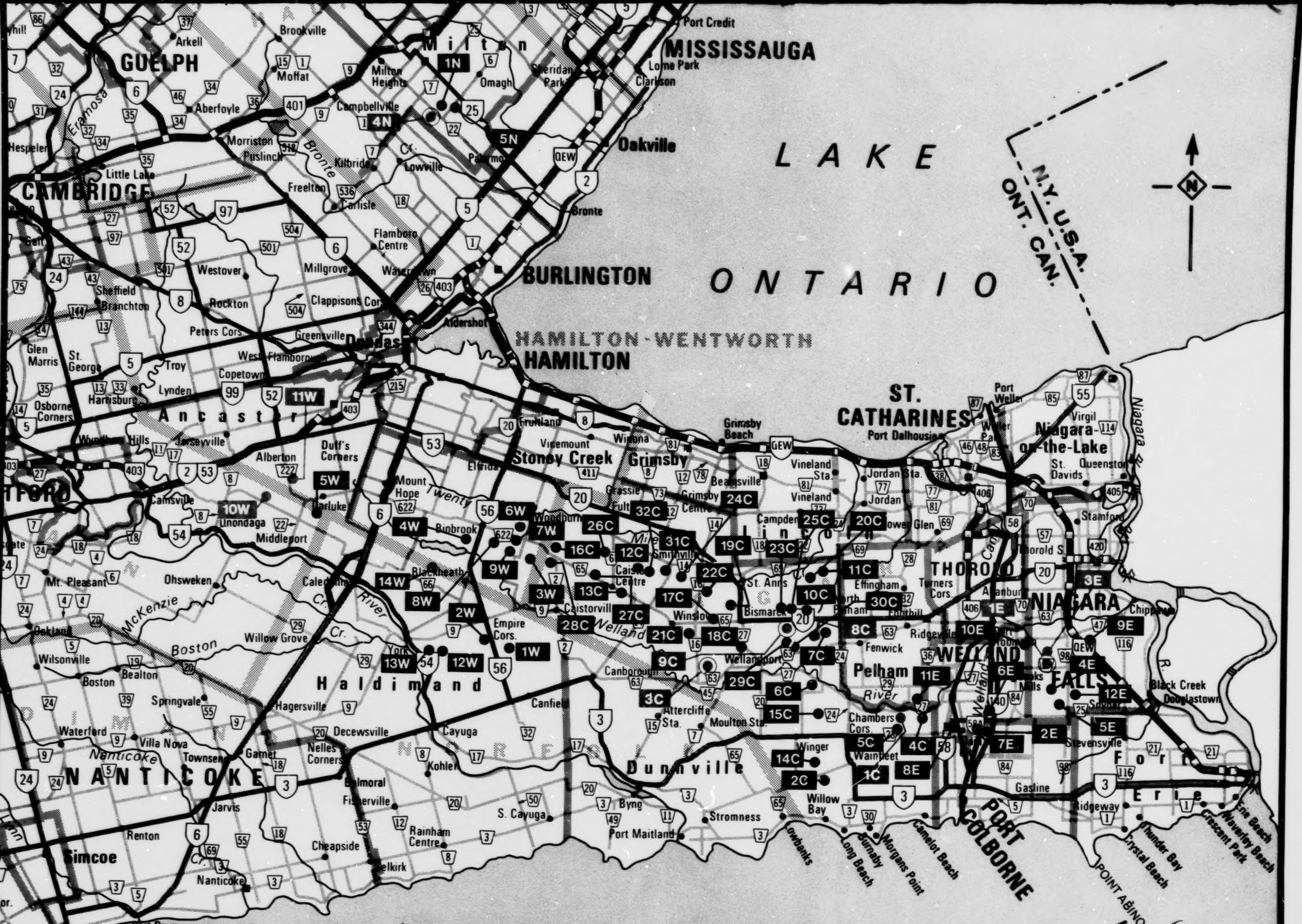
QEW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MISSISSAUGA
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Clarkson
Sheridan Park
Milton
1N
Brookville
Arkell
Moffat
Milton Heights
Omagh
Campbellville
4N
5N
Aberfoyle
Eramosa
Hespeler
Morriston
Puslinch
Bronte
Kilbride
Lowville
Palermo
Oakville
QEW
Bronte
CAMBRIDGE
Little Lake
Freelton
Carlisle
Flamboro Centre
Millgrove
Waterdown
BURLINGTON
Westover
Rockton
Sheffield
Branchton
Clappisons Cors.
Peters Cors.
Greensville
Dundas
Aldershot
West Flamboro
HAMILTON-WENTWORTH
HAMILTON
Glen Morris
St. George
Troy
Copetown
Lynden
Harrisburg
11W
Osborne Corners
Ancaster
Wyndham Hills
Jerseyville
Alberton
Duff's Corners
Fruitland
Vinemount
Winona
Stoney Creek
Grimsby
Grimsby Beach
ST. CATHARINES
Port Dalhousie
Port Weller
Virgil
Niagara-on-the-Lake
St. Davids
Queenston
Niagara R.
Vineland Sta.
Vineland
Jordan Sta.
Jordan
Beamsville
Grassie
Fulton
Grimsby Centre
24C
5W
Mount Hope
Twenty
Elfrida
Carlisle
Caledonia
10W
Onondaga
Middleport
Glanford
Binbrook
6W
7W
4W
Woodburn
26C
32C
Campden
Lincoln
25C
20C
Lower Glen
Stamford
31C
19C
23C
16C
12C
Smithville
22C
St. Anns
11C
Effingham
THOROLD
Thorold S.
Turners Cors.
3E
Allanburg
NIAGARA
1E
Chippawa
9W
Blackheath
14W
8W
3W
13C
Caistor Centre
Caistorville
17C
10C
30C
Fonthill
Ohsweken
Mt. Pleasant
McKenzie
Boston Cr.
Cr.
River
2W
Empire Cors.
28C
27C
Welland
Winslow
Bismarck
21C
18C
8C
Ridgeville
10E
9E
Fenwick
Oakland
Wilsonville
Boston
Bealton
Willow Grove
York
13W
12W
1W
Haldimand
Wellandport
9C
29C
7C
Pelham
11E
WELLAND
6E
Marshville
4E
FALLS
12E
Black Creek
Douglastown
Springvale
Hagersville
Canfield
Canborough
Attercliffe Sta.
Moulton Sta.
3C
6C
15C
Chambers Cors.
River
Welland
Cooks Mills
Sodom
Waterford
Villa Nova
Nanticoke
Townsend
Garnet
Decewsville
Nelles Corners
Cayuga
Norfolk
2E
5E
Stevensville
5C
Wainfleet
4C
7E
Fort Erie
NANTICOKE
Balmoral
Kohler
Dunnville
Winger
14C
2C
1C
8E
Gasline
Jarvis
Fisherville
S. Cayuga
Byng
Port Maitland
Stromness
Willow Bay
Ridgeway
Renton
Simcoe
Cheapside
Rainham Centre
Selkirk
Nanticoke
Lowbanks
Long Beach
Burnaby
Morgans Point
Camelot Beach
PORT COLBORNE
POINT ABINO
Crystal Beach
Thunder Bay
Crescent Park
Waverley Beach
Erie Beach
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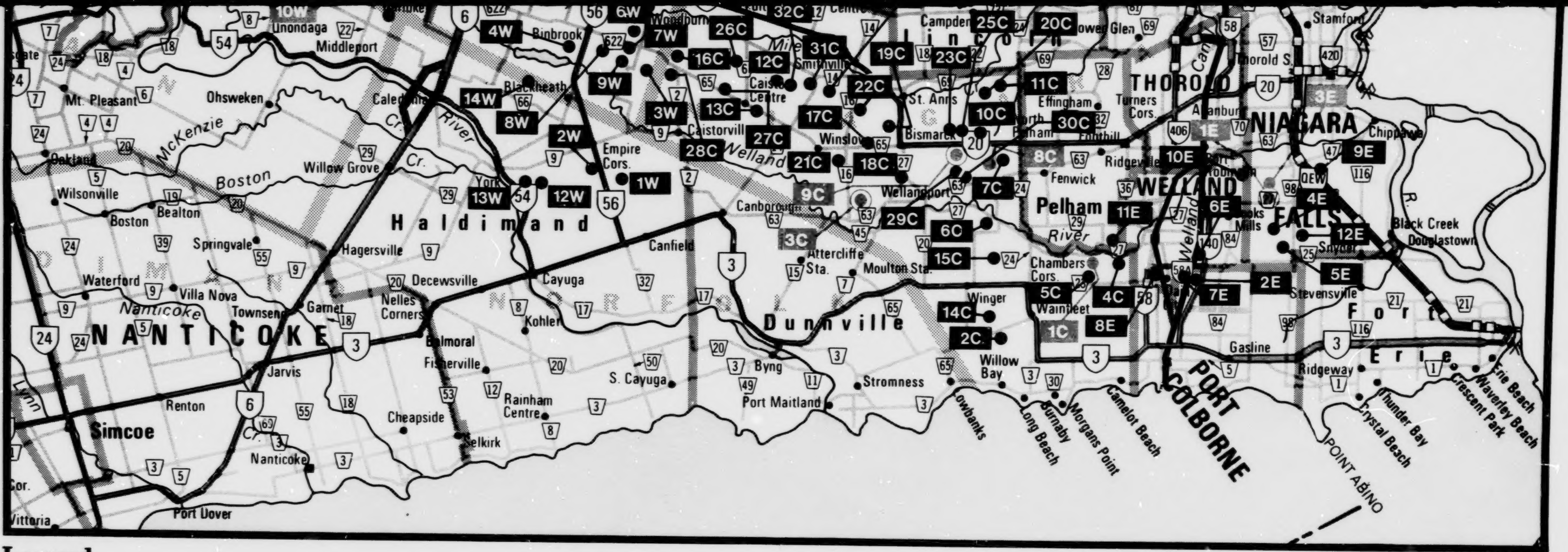
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27C
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8C
10E
9E
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9C
7C
4E
6E
11E
29C
3C
6C
12E
15C
5E
2E
5C
4C
7E
14C
1C
8E
2C
Onondaga
Middleport
Binbrook
Woodburn
Campden
Lincoln
Stamford
Mt. Pleasant
Ohsweken
Caledonia
Blackheath
Caistor Centre
Smithville
St. Anns
Effingham
Turners Cors.
THOROLD
Thorold S.
Allanburg
NIAGARA
Chippawa
Oakland
McKenzie
Willow Grove
Empire Cors.
Caistorville
Welland
Winslow
Bismarck
Fonthill
Ridgeville
Fenwick
Wilsonville
Boston
Bealton
Haldimand
York
Canborough
Wellandport
Pelham
WELLAND
FALLS
Black Creek
Douglastown
Springvale
Hagersville
Canfield
Attercliffe Sta.
Moulton Sta.
River
Chambers Cors.
Snyder
Waterford
Villa Nova
Nanticoke
Townsend
Garnet
Decewsville
Nelles Corners
Cayuga
Kohler
Winger
Wainfleet
Stevensville
NANTICOKE
Balmoral
Dunnville
Fort Erie
Fisherville
Jarvis
Byng
Stromness
Willow Bay
Gasline
Ridgeway
S. Cayuga
Port Maitland
Renton
Simcoe
Rainham Centre
Cheapside
Selkirk
Nanticoke
Lowbanks
Long Beach
Burnaby
Morgans Point
Camelot Beach
PORT COLBORNE
POINT ABINO
Crystal Beach
Thunder Bay
Crescent Park
Waverley Beach
Erie Beach
Port Dover
Vittoria

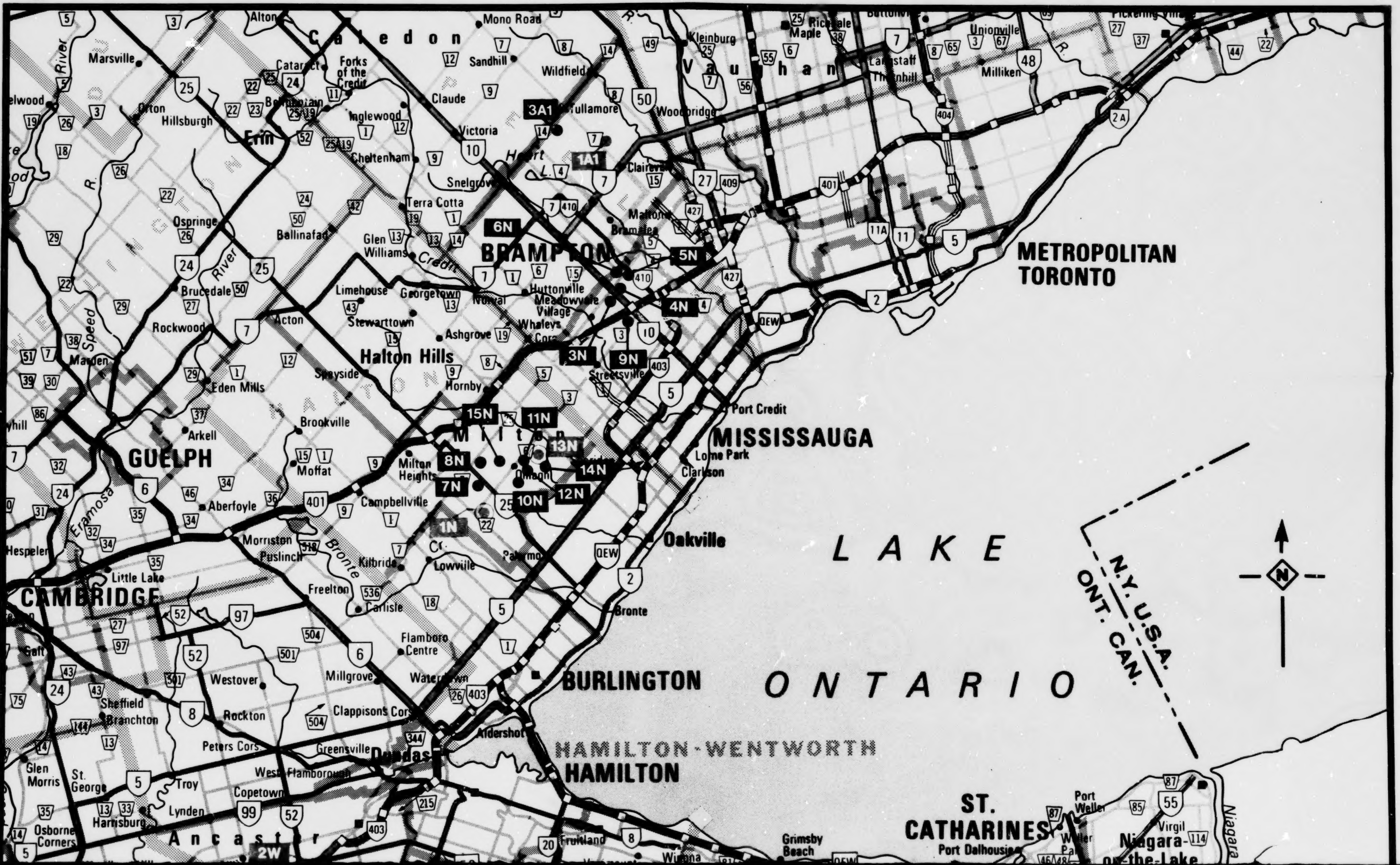
Source: Ontario Waste Management Corporation, March 1984

## Legend

- ● Suitability Screen
- ● Sites Remaining For Initial Comparative Evaluation
- ◉ Candidate Sites

Miles 0 10 Kilometers 0 10

Figure 15. Site Areas — Physical/Chemical Treatment Plants & Incinerators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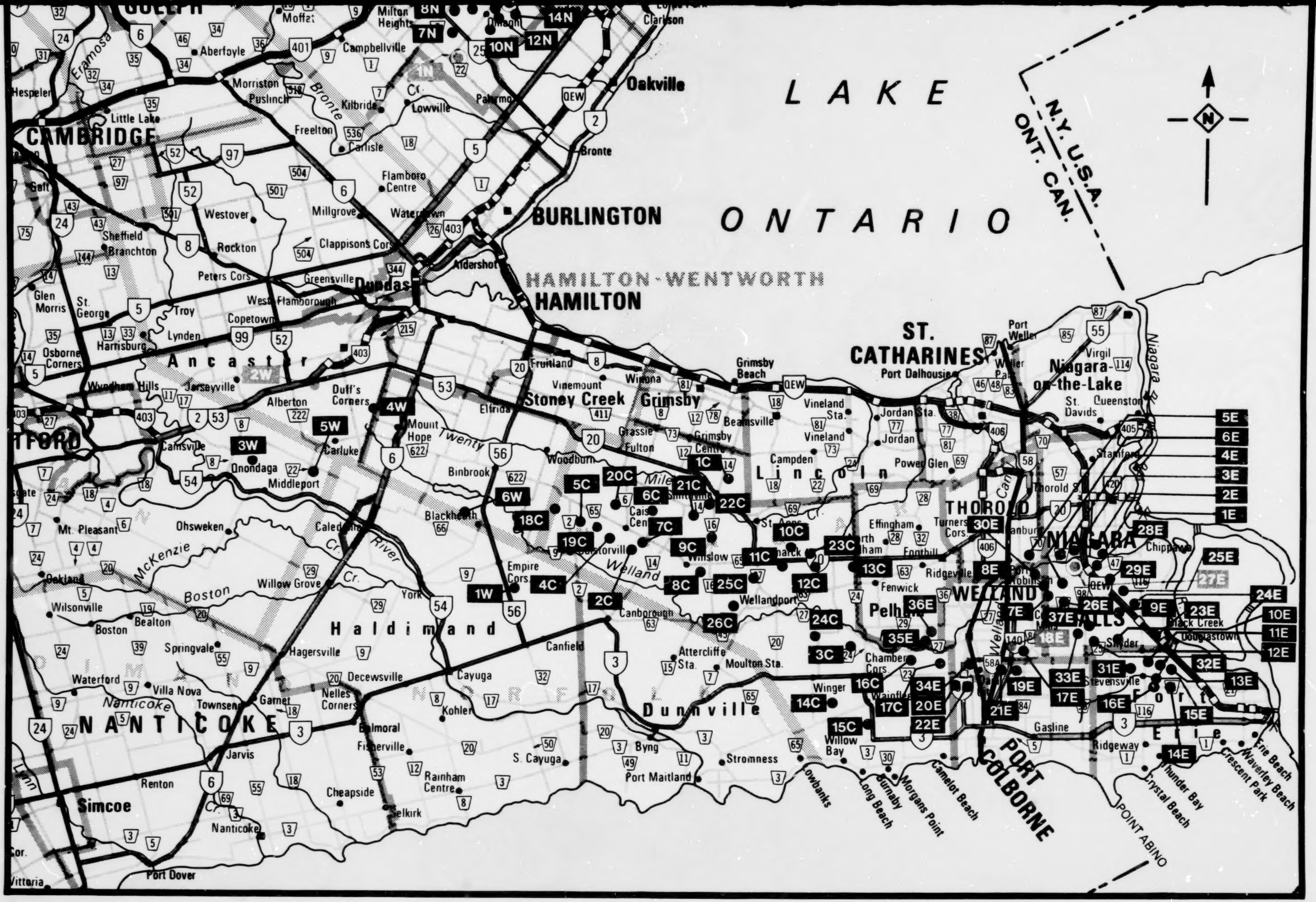
2W
Caledon
Vaughan
BRAMPTON
Halton Hills
Milton
GUELPH
CAMBRIDGE
MISSISSAUGA
METROPOLITAN TORONTO
Oakville
BURLINGTON
HAMILTON-WENTWORTH
HAMILTON
ST. CATHARINES
Ancaster
LAKE ONTARIO
N.Y. U.S.A.
ONT. CAN.
N
Mono Road
Sandhill
Wildfield
Tullamore
Woodbridge
Kleinburg
Maple
Richvale
Langstaff
Thornhill
Unionville
Milliken
Pickering Village
Alton
Forks of the Credit
Cataract
Belfountain
Inglewood
Claude
Victoria
Cheltenham
Snelgrove
Terra Cotta
Glen Williams
Georgetown
Limehouse
Stewarttown
Ashgrove
Norval
Huttonville
Meadowvale Village
Whaleys Corners
Claireville
Malton
Bramalea
Streetsville
Port Credit
Lorne Park
Clarkson
Marsville
Orton
Hillsburgh
Erin
Ospringe
Ballinafad
Brucedale
Rockwood
Acton
Speedside
Eden Mills
Arkell
Brookville
Moffat
Milton Heights
Hornby
Campbellville
Aberfoyle
Morriston
Puslinch
Kilbride
Lowville
Palermo
Freelton
Carlisle
Bronte
Flamboro Centre
Waterdown
Millgrove
Clappisons Cors
Westover
Rockton
Aldershot
Greensville
Dundas
West Flamborough
Peters Cors
Sheffield
Branchton
Troy
Lynden
Copetown
Harrisburg
St. George
Glen Morris
Osborne Corners
Galt
Hespeler
Little Lake
Maryden
Fruitland
Winona
Grimsby Beach
Port Weller
Port Dalhousie
Virgil
Niagara-on-the-Lake
Niagara
Credit
Heart L.
Speed River
Eramosa
Bronte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BURLINGTON
HAMILTON-WENTWORTH
HAMILTON
ST. CATHARINES
Oakville
Bronte
Clarkson
Milton Heights
Moffat
Aberfoyle
Campbellville
Morriston
Puslinch
Kilbride
Lowville
Palermo
Freelton
Carlisle
Flamboro Centre
Millgrove
Waterdown
Aldershot
Westover
Rockton
Clappisons Cors.
Greensville
Dundas
West Flamborough
Copetown
Hespeler
Little Lake
Galt
Sheffield
Branchton
Peters Cors.
Troy
Glen Morris
St. George
Lynden
Harrisburg
Osborne Corners
Ancaster
Wyndham Hills
Jerseyville
Alberton
Duff's Corners
Mount Hope
Carluke
Middleport
Onondaga
Cainsville
Stoney Creek
Grimsby
Fruitland
Vinemount
Winona
Elfrida
Woodburn
Binbrook
Blackheath
Grimsby Beach
Beamsville
Grassie
Fulton
Grimsby Centre
Vineland Sta.
Vineland
Campden
Jordan Sta.
Jordan
Power Glen
Port Dalhousie
Port Weller
Niagara-on-the-Lake
Virgil
St. Davids
Queenston
Stamford
Thorold
THOROLD
NIAGARA
Chippawa
Effingham
Turners Cors.
Fonthill
Ridgeville
Fenwick
Pelham
WELLAND
Caistor Centre
Smithville
Wellandport
Canborough
Attercliffe Sta.
Moulton Sta.
Winger
Chambers Cors.
Wainfleet
Willow Bay
Lincoln
Twenty Mile Cr.
Welland River
Mt. Pleasant
Ohsweken
Caledonia
McKenzie Cr.
Oakland
Boston Cr.
Willow Grove
York
Empire Cors.
Wilsonville
Boston
Bealton
Springvale
Hagersville
Haldimand
Canfield
Cayuga
Decewsville
Nelles Corners
Kohler
Waterford
Villa Nova
Townsend
Garnet
Nanticoke Cr.
NANTICOKE
Jarvis
Balmoral
Fisherville
Rainham Centre
Renton
Simcoe
Cheapside
Selkirk
S. Cayuga
Byng
Port Maitland
Dunnville
Stromness
Lowbanks
Long Beach
Burnaby
Morgans Point
Camelot Beach
PORT COLBORNE
Gasline
Ridgeway
Crystal Beach
Thunder Bay
Crescent Park
Waverley Beach
Erie Beach
Fort Erie
Black Creek
Douglastown
Snyder
Stevensville
POINT ABINO
Niagara R.
Nanticoke
Port Dover
Vittoria
Norfolk
1N
7N
8N
10N
12N
14N
1W
2W
3W
4W
5W
6W
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30E
31E
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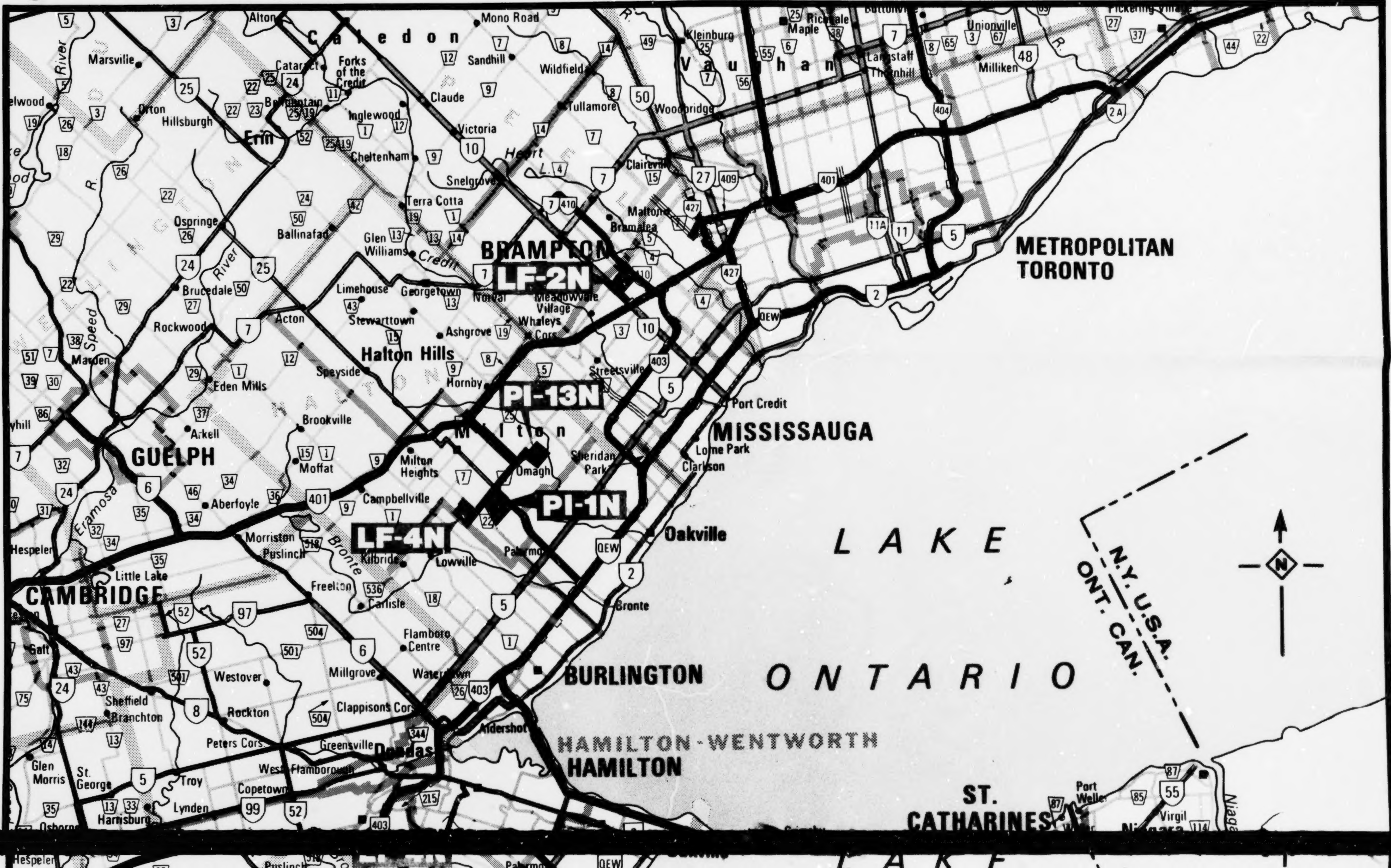
33E
34E
35E
36E
37E
QEW
401
403
406

## Legend

Source: Ontario Waste Management Corporation, March 1984

Figure 18. Candidate Sites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PI-13N
PI-1N
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MISSISSAUGA
BRAMPTON
GUELPH
CAMBRIDGE
BURLINGTON
HAMILTON-WENTWORTH
HAMILTON
ST. CATHARINES
Oakville
Milton
Halton Hills
Caledon
Vaughan
LAKE ONTARIO
N.Y. U.S.A.
ONT. CAN.
N
Georgetown
Acton
Erin
Port Credit
Streetsville
Meadowvale Village
Omagh
Sheridan Park
Campbellville
Moffat
Kilbride
Lowville
Palermo
Bronte
Aldershot
Dundas
Waterdown
Flamboro Centre
Carlisle
Freelton
Morriston
Puslinch
Aberfoyle
Rockwood
Eden Mills
Brookville
Hornby
Limehouse
Glen Williams
Terra Cotta
Cheltenham
Inglewood
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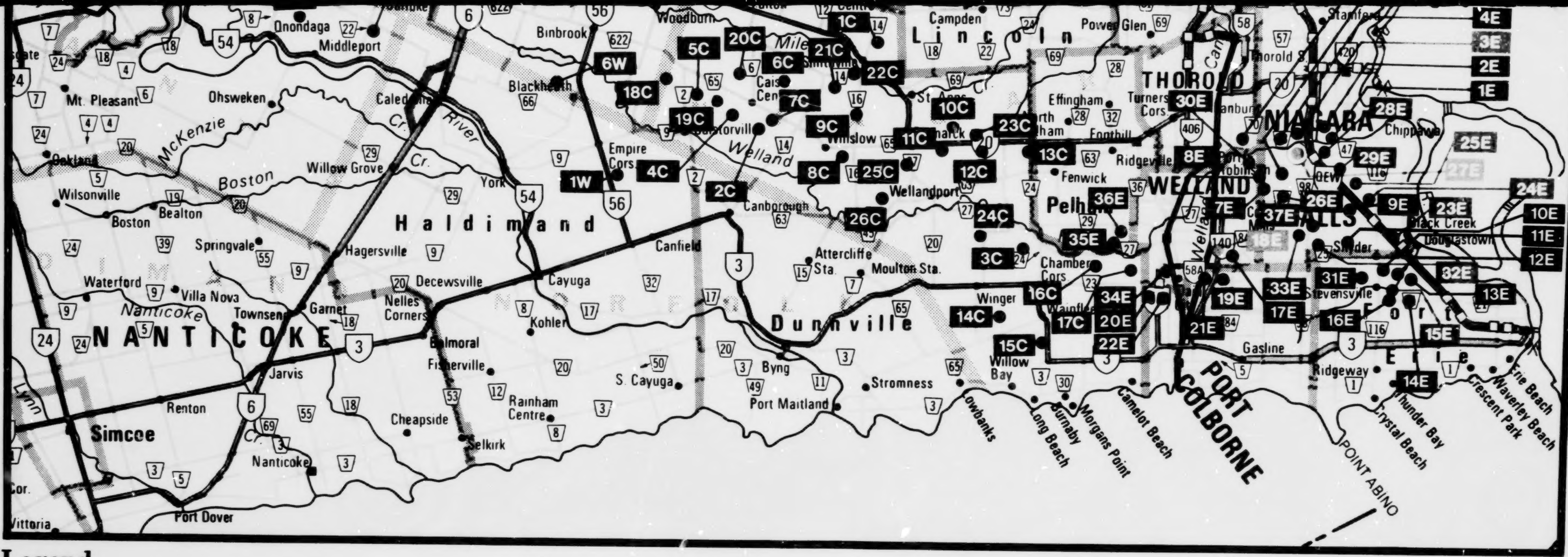
Virgil



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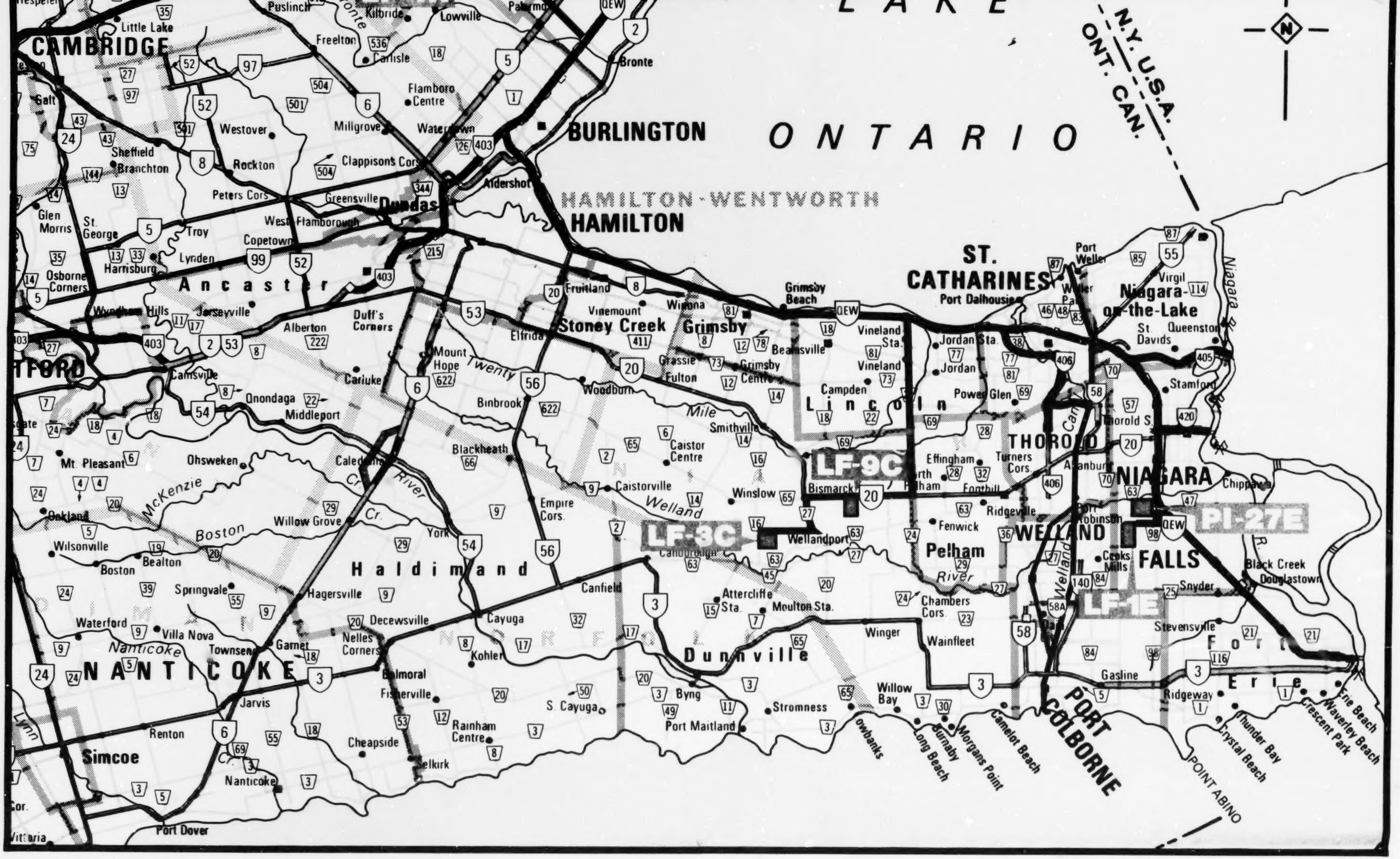
NIAGARA
WELLAND
Pelham
Haldimand
NANTICOKE
Dunnville
PORT COLBORNE
Fort Erie
Simcoe
Port Dover
Jarvis
Cayuga
Caledonia
Hagersville
Binbrook
Campden
Power Glen
Fenwick
Ridgeway
Crystal Beach
POINT ABINO

Source: Ontario Waste Management Corporation, March 1984

## Legend

- ● Suitability Screen
- ● Compatibility Screen
- ● Systems Screen
- ● Sites Remaining For Initial Comparative Evaluation
- ● Candidate Sites

Miles 0 10 Kilometers 0 10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Little Lake
Puslinch
Kilbride
Lowville
Freelton
Carlisle
Bronte
Galt
Flamboro Centre
Millgrove
Waterdown
BURLINGTON
Westover
Sheffield
Branchton
Rockton
Clappisons Cors
Peters Cors
Greensville
Dundas
Aldershot
HAMILTON-WENTWORTH
HAMILTON
Glen Morris
St. George
Troy
West Flamborough
Copetown
Lynden
Harrisburg
Osborne Corners
Ancaster
Fruitland
Vinemount
Winona
Grimsby Beach
ST. CATHARINES
Port Dalhousie
Port Weller
Virgil
Niagara-on-the-Lake
St. Davids
Queenston
Wyndham Hills
Jerseyville
Alberton
Duff's Corners
Elfrida
Stoney Creek
Grimsby
Beamsville
Vineland Sta.
Vineland
Jordan Sta.
Jordan
Mount Hope
Twenty
Carluke
Binbrook
Woodburn
Grassie
Fulton
Grimsby Centre
Campden
Power Glen
Stamford
Cainsville
Onondaga
Middleport
Lincoln
Smithville
Mile
Caistor Centre
THOROLD
Thorold S.
Mt. Pleasant
Ohsweken
Caledonia
River
Blackheath
Caistorville
Winslow
LF-9C
Bismarck
Effingham
North Pelham
Turners Cors.
Fonthill
Allanburg
NIAGARA
Chippawa
McKenzie
Cr.
Oakland
Willow Grove
Empire Cors.
Welland
LF-3C
Wellandport
Canborough
Fenwick
Ridgeville
Port Robinson
PI-27E
Wilsonville
Boston
Bealton
York
Haldimand
Pelham
WELLAND
FALLS
Cooks Mills
Black Creek
Douglastown
Springvale
Hagersville
Canfield
Attercliffe Sta.
Moulton Sta.
Chambers Cors.
Snyder
LF-1E
Waterford
Villa Nova
Decewsville
Cayuga
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Winger
Wainfleet
Stevensville
Fort Erie
Nanticoke
NANTICOKE
Balmoral
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Port Maitland
Stromness
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Ridgeway
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Simcoe
Rainham Centre
Cheapside
Selkirk
Lowbanks
Long Beach
Burnaby
Morgans Point
Camelot Beach
PORT COLBORNE
POINT ABINO
Crystal Beach
Thunder Bay
Crescent Park
Waverley Beach
Erie Beach
Nanticoke
Port Dover
Vittoria
QEW

Source: Ontario Waste Management Corporation, March 1984

Miles 0 10 Kilometers 0 10

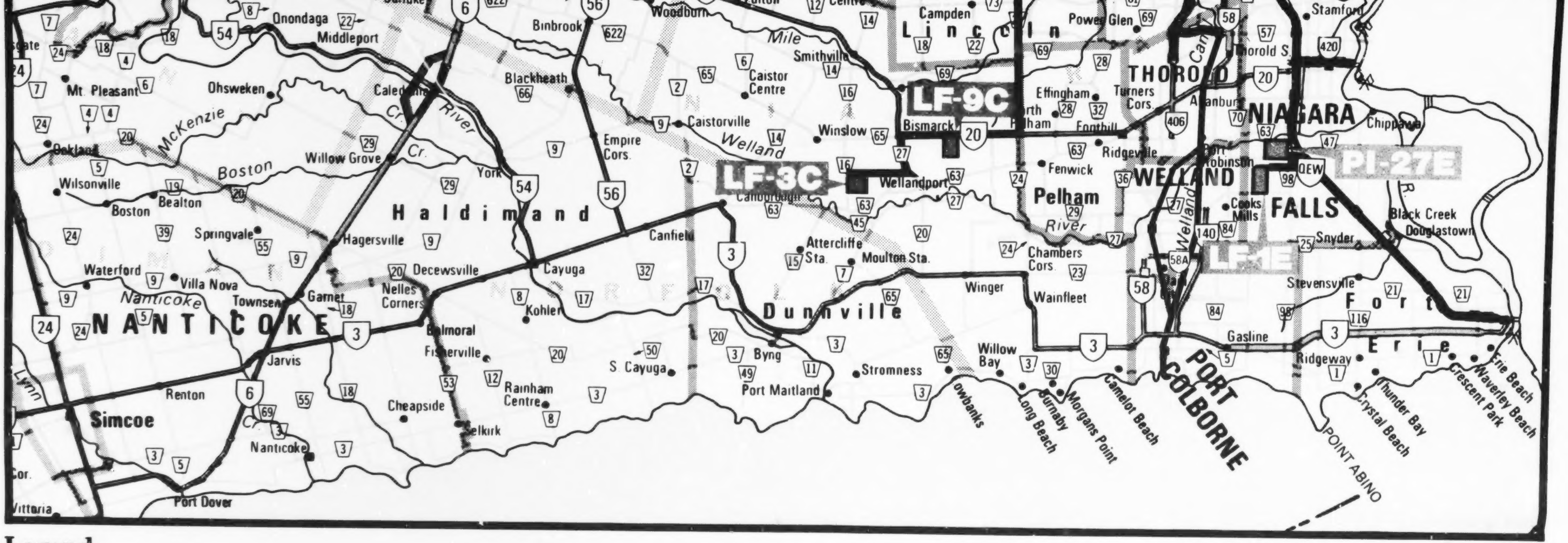
## Legend

▬ 400 Series Highways

▬ Provincial Roads & Highways

Candidate Sites:

| Site Name | Landfill | Physical/ Chemical | Incinerator | |
|---|---|---|---|---|
| LF-2N | • | • | | |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LF-1E
PI-27E
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Lincoln
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WELLAND
PORT COLBORNE
Pelham
Dunnville
Fort Erie
Simcoe
Onondaga
Middleport
Binbrook
Woodburn
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Mt. Pleasant
Ohsweken
Caledonia
Blackheath
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Turners Cors.
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Chippawa
Caistorville
Winslow
Bismarck
Fonthill
Ridgeville
Port Robinson
Fenwick
Wellandport
Canborough
Oakland
Wilsonville
Boston
Bealton
Springvale
Willow Grove
York
Empire Cors.
Hagersville
Canfield
Cayuga
Decewsville
Nelles Corners
Waterford
Villa Nova
Townsend
Garnet
Kohler
Attercliffe Sta.
Moulton Sta.
Chambers Cors.
Winger
Wainfleet
Cooks Mills
Snyder
Black Creek
Douglastown
Stevensville
Balmoral
Fisherville
Jarvis
Renton
Rainham Centre
Cheapside
Selkirk
S. Cayuga
Byng
Port Maitland
Stromness
Willow Bay
Gasline
Ridgeway
Nanticoke
Port Dover
Vittoria
Lowbanks
Long Beach
Burnaby
Morgans Point
Camelot Beach
Crystal Beach
Thunder Bay
Crescent Park
Waverley Beach
Erie Beach
POINT ABINO
McKenzie Cr.
Boston Cr.
Nanticoke Cr.
Grand River
Welland River
Welland Canal
Twenty Mile Cr.
QEW

## Legend

Source: Ontario Waste Management Corporation, March 1984

Miles 0 10 Kilometers 0 10

▬ 400 Series Highways

▬ Provincial Roads & Highways

═ Local Roads

— Regional Roads

▨ Regional Municipalities & County Boundaries

▨ Township, Town & City Boundaries

▬ Access Roads

▢ Candidate Site

Candidate Sites:

| Site Name | Landfill | Physical/ Chemical | Incinerator | |
|---|---|---|---|---|
| LF-2N | • | • | | |
| LF-4N | • | • | | |
| PI-1N | | • | • | |
| PI-13N | | • | • | |
| LF-9C | • | • | • | Integrated |
| LF-3C | • | • | • | Integrated |
| LF-1E | • | • | • | Integrated |
| PI-27E | | • | • | |